

Gigantic likenesses of U.S. Presidents Washington, Jefferson, Lincoln, and Theodore Roosevelt are carved into the side of Mount Rushmore, in the Black Hills of South Dakota.

William Hubbell-Woodfin Camp & Associates, Inc.

FUNK & WAGNALLS NEW ENCYCLO- PEDIA

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UNITED STATES

to WATERWORKS

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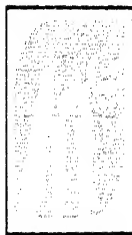
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**FUNK &
WAGNALLS
NEW
ENCYCLO-
PEDIA**



LIST OF ABBREVIATIONS USED IN THE TEXT*

abbr.	abbreviated	fr.	from	OHG.	Old High German
AC; a-c	alternating current	Fr.	French	ON.	Old Norse
A.D.	<i>anno Domini</i> (Lat., in the year of the Lord)	ft.	foot	ONF.	Old Norman French
alt.	altitude	g	gram	O.T.	Old Testament
A.M.	<i>ante meridiem</i> (Lat., before noon)	Gael.	Gaelic	oz.	ounce
AM	amplitude modulation	gal.	gallon	P.M.	<i>post meridiem</i> (Lat., after noon)
amu or AMU	atomic mass unit	Ger.	German	Pol.	Polish
anc.	ancient	Gr.	Greek	pop.	population
Ar.	Arabic	Heb.	Hebrew	Port.	Portuguese
AS.	Anglo-Saxon	Hind.	Hindustani	prelim.	preliminary
A.S.S.R.	Autonomous Soviet Socialist Republic	h.p.	horsepower	pron.	pronounced
at.no.	atomic number	hr.	hour	q.v.	<i>quod vide</i> (Lat., which see)**
at.wt.	atomic weight	Hung.	Hungarian	r.	reigned
b.	born	Hz	hertz or cycles per second	R.	River
bbl	barrel	l.	Island	rev.	revised; revision
B.C.	before Christ	i.e.	<i>id est</i> (Lat., that is)	R.R.	railroad
bd.ft.	board feet	in.	inch	Rum.	Rumanian
bev or	billion electron	Ind.	Indian	Russ.	Russian
BeV	volts	Ir.	Irish	Ry.	railway
b.p.	boiling point	It.	Italian	S.	south; southern
B.T.U.	British Thermal Unit	K.	Kelvin	sec.	second
bu.	bushel	kg	kilogram	S.F.S.R.	Soviet Federated Socialist Republic
Bulg.	Bulgarian	kHz	kilohertz	Skr.	Sanskrit
C.	centigrade	km	kilometer	Sp.	Spanish
cent.	century	kw	kilowatt	sp.gr.	specific gravity
Chin.	Chinese	kw hour	kilowatt hour	sq.	square
cm	centimeter	lat.	latitude	sq.mi.	square mile
Co.	County	Lat.	Latin	S.S.R.	Soviet Socialist Republic
colloq.	colloquial	lb.	pound	St.; Ste.	Saint
cu.	cubic	long.	longitude	Sum.	Sumerian
Czech.	Czechoslovakian	m	meter	Sw.	Swedish
d.	died	M.	Middle	temp.	temperature
Dan.	Danish	mev or	million electron volts	trans.	translation
DC; d-c	direct current	MEV	volts	Turk.	Turkish
Du.	Dutch	mg	milligram	U.K.	United Kingdom
E.	east; eastern	MHz	megahertz	U.N.	United Nations
ed.	edition; editor	mi.	mile	U.S.	United States
Egypt.	Egyptian	min.	minute	U.S.A.	United States of America
Eng.	English	M.L.	Medieval Latin	U.S.S.R.	Union of Soviet Socialist Republics
est.	estimated	mm	millimeter	var.	variant
ev or	electron volt	mod.	modern	vol.	volume
EV		m.p.	melting point	vs.	versus or against
F.	Fahrenheit	m.p.h.	miles per hour	W.	west; western
fl.	flourished	Mt(s).	Mount, Mountain	yd.	yard
FM	frequency modulation	N.	north; northern		
		Norw.	Norwegian		
		N.T.	New Testament		
		OE.	Old English		
		OF.	Old French		

*For a more extensive listing of abbreviations, widely used by authoritative sources in many fields, see ABBREVIATION. Charts of pertinent abbreviations also accompany the articles BIBLE, CANON OF THE; DEGREE, ACADEMIC; ELEMENTS, CHEMICAL; MATHEMATICAL SYMBOLS; and WEIGHTS AND MEASURES. Accent marks and special letters are explained in the article DIACRITIC MARK.

**The abbreviation (q.v.) stands for the Latin words "quod vide", meaning "which see". The placement of this abbreviation after a word—or a name or term—indicates that the word itself is the title of a separate article in the encyclopedia. By looking up the article on this word, or the entries on each word in a series that is followed by the plural form (qq.v.) of the abbreviation, the reader will find specific information about the words used as well as data about the main topic of the article he is reading.

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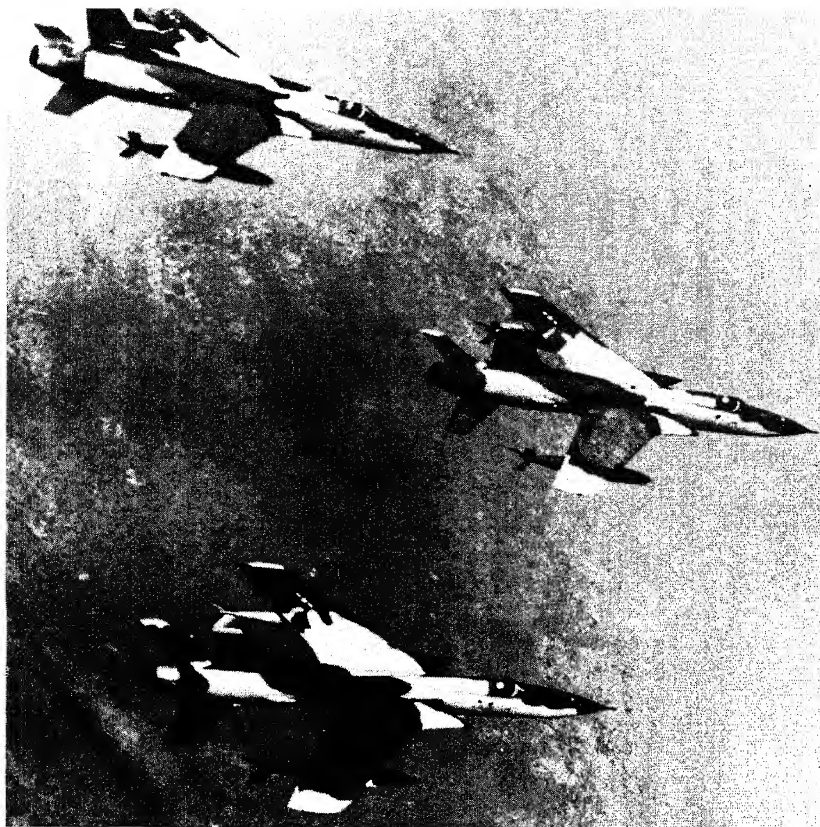
UNITED STATES. See UNITED STATES OF AMERICA, THE.

UNITED STATES AIR FORCE, usually abbreviated U.S.A.F., military force of the United States Department of Defense whose basic mission is to maintain the air defense of the U.S. The secretary of the U.S. Air Force, a civilian appointed by the President, controls and directs the air force except for combat operations. These operations, which require joint planning with the other military services, are controlled by the Department of Defense. The undersecretary is the secretary's principal assistant. The

secretary's staff includes assistant secretaries for research and development, installations and logistics, manpower and reserve affairs, and financial management. Special offices of the secretary's staff include those of general counsel, administrative assistant, legislative liaison, information (public), and space systems. The air force staff, headed by the chief of staff, assists the secretary, the undersecretary, and the assistant secretaries and is responsible for direction

Demonstration of techniques used by helicopter crews flying into North Vietnam to rescue pilots of downed bomber aircraft.
U.S. Air Force





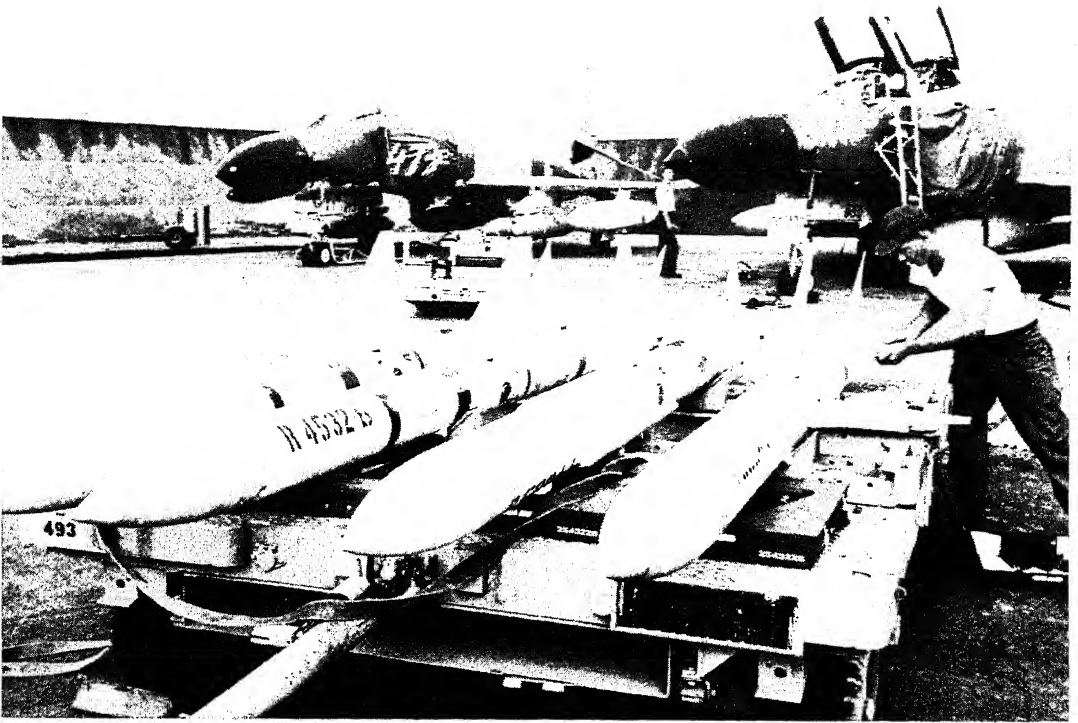
Air Force Thunderchief bombers fly from their base in Thailand to strike a military target in North Vietnam.
U.S. Air Force

and control of the air force. As a member of the Joint Chiefs of Staff, the air force chief of staff participates in joint planning and use of air power in military operations at the Department of Defense level. See DEFENSE, DEPARTMENT OF.

Commands. For internal air force matters the Headquarters, Department of the Air Force maintains control and supervision through fifteen major commands and nine operating agencies. Among these commands, the *Aerospace Defense Command* in Colorado is responsible for detecting and destroying any air attack on North America. The *Strategic Air Command*, with headquarters in Nebraska, consists of aircraft and intercontinental ballistic missiles capable of directing nuclear explosives to any part of the earth. The *Tactical Air Command*, centered in Virginia, trains and maintains combat-ready forces for tactical air operations. In West Germany the *U.S. Air Forces in Europe* assists the North Atlantic Treaty Organization (q.v.) in the defense of Western Europe. Similarly, *Pacific Air Forces*, centered in Hawaii, controls the air over parts of the Pacific Ocean and in the Far East in conjunction with other allies, and the *Alaskan Air Command* maintains air surveillance over that area. In the Canal Zone, the *U.S. Air Forces Southern Command* is responsible for improving Latin-American air forces. In

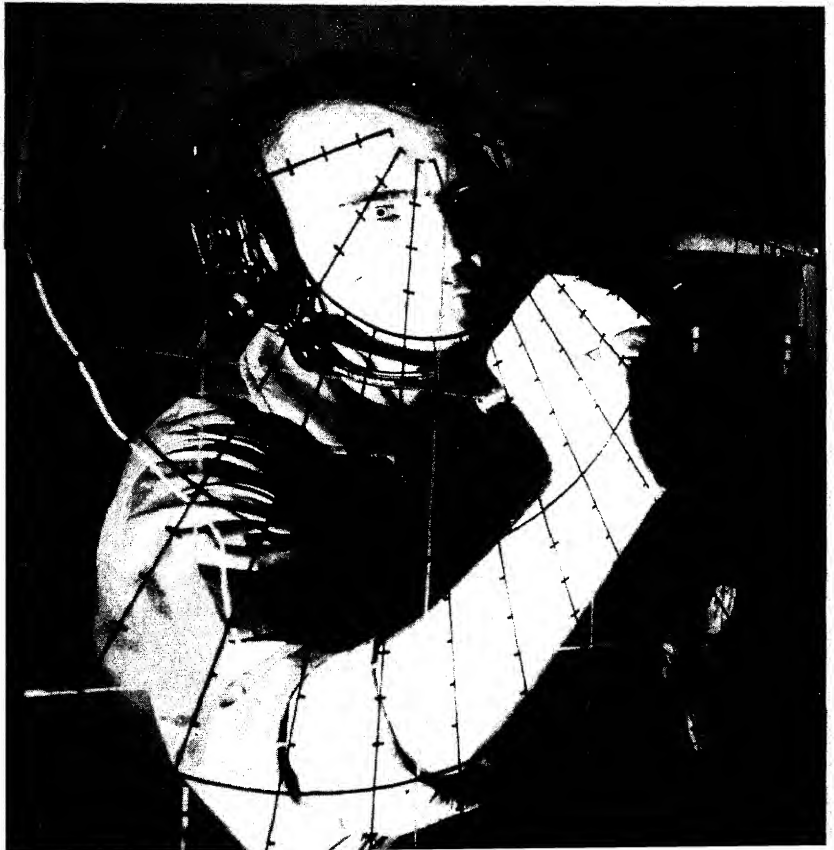
addition, the *Air Force Logistics Command* in Ohio provides worldwide logistics support to the air force, and the *Air Training Command* in Texas supervises recruiting and provides training for all personnel. A global airlift system for the armed forces is operated by the *Military Airlift Command*, centered in Illinois, which also conducts aerospace rescue and recovery, weather, and air photographic and geodetic services for the armed forces. Communications security is provided by the *U.S. Air Force Security Service* in Texas to safeguard information transmitted by electrical means. The *Air Force Communications Service*, centered in Missouri, provides communications, flight facilities, and navigational aids for all the armed forces. Of the remaining commands the *Air Force Systems Command* in Maryland manages air force scientific and technical resources and all phases of acquisition of new aerospace systems; the *Air University* in Alabama provides advanced military education for air force officers and special groups of officers of the army, navy, and allied forces; and *Headquarters Command, U.S.A.F.* in Washington, D.C., supports and services air force headquarters and military advisory groups and attaché offices, and operates the air force postal service.

Of the nine separate operating agencies, the



Above: Sparrow III-B air-to-air missiles are prepared for loading on Air Force planes in South Vietnam. Below: Airman studies the plotting board, which allows crew members to keep track of other aircraft aloft, on a radar-equipped combat plane used in Southeast Asia.

U.S. Air Force



UNITED STATES AIR FORCE

Air Force Accounting and Finance Center in Colorado processes all centralized accounting functions. The *Air Reserve Personnel Center* in Colorado supervises personnel administration for members of the Air Force Reserve. The *Air Force Audit Agency* in California is responsible for all internal auditing functions. The *Air Force Data Automation Agency* in Alabama designs, develops, tests, implements, and maintains all automated data processing systems. The *Air Force Inspection and Safety Center* in California provides inspection and safety consultation and monitors accident prevention and investigative activities. The *Air Force Military Personnel Center* in Texas provides all personnel administration functions. The *Air Force Office of Special Investigations* in Washington, D.C., provides investigative services in the areas of criminal investigation, counterintelligence, and fraud. The *Air Force Reserve* in Georgia commands and helps plan management of air-reserve activities. Finally, the *Air Force Academy* in Colorado trains cadets to become career officers.

The organization of operational air force units beneath various commands varies widely, depending upon the type of unit (combat, air transport, maintenance), aircraft, and mission. A typical tactical fighter squadron consists of approximately 600 personnel and 20 aircraft. Four or more squadrons form a wing, two or more wings a division, and two or more divisions a numbered air force.

Air Reserve Forces. The reserves, officially the Air Reserve Forces, consist of the Air National Guard and the Air Force Reserve. Air Force Reserve units and individuals are supervised by Department of Air Force and may be called to active duty upon declaration of an emergency by the President or Congress. The Air National Guard consists only of flying or supporting units. They are organized by State and except when Federalized are commanded by their respective State governors. They receive policy guidance and support, however, from U.S.A.F. and National Guard Bureau regulations (most of which are similar), promulgated through the National Guard Bureau. *See also* NATIONAL GUARD OF THE UNITED STATES.

History. The air force was conceived on Aug. 1, 1907, when the Aeronautical Division of the U.S. Army Signal Corps was organized with three men to study possible military uses of airplanes. By the end of World War I (q.v.) the U.S. had 740 airplanes in 45 squadrons, and more than 1200 airmen in France. In 1918, Congress authorized the Air Service, still under the U.S. Army. In 1926 the Air Service was renamed the

Air Corps. In 1935 General Headquarters, Air Force, was organized into a combat force composed of fighting units of the air arm. This organization became the Air Force Combat Command in 1941 and, subsequently, the Army Air Force of World War II (q.v.). With enactment of the National Security Act of 1947 the air force became an autonomous military force, with a strength of approximately 300,000 personnel and 25,000 aircraft. In 1956 the air force was assigned sole responsibility for all land-based intermediate and intercontinental ballistic missile systems and three years later for launch and development of all military boosters. By 1965 the air force was made responsible for research and development of satellites, boosters, space probes, and associated systems used by the National Aeronautics and Space Administration (q.v.). *See also* KOREAN WAR; VIETNAM, WAR IN.

H.M.L.

UNITED STATES AIR FORCE ACADEMY, institution of the Federal Government for educating and training officers for the U.S. Air Force, located 10 miles N. of Colorado Springs, Colo. The United States Congress authorized the establishment of the academy in 1954; the first class of 306 cadets was enrolled in July 1955. **Application.** Candidates seeking admission to the academy must be unmarried U.S. citizens of good moral character between the ages of seventeen and twenty-two. They must pass a medical examination and perform well on the admission tests. The candidate's prior academic record, character, extracurricular activities, and physical aptitude are also considered.

Appointment. Appointments to the academy are made in the following ways. Each U.S. Representative has an accumulative quota of five appointees in the academy at any one time and may nominate ten young men and women (since 1976) against each vacancy available to him. The Vice-President also has an accumulative quota of five appointees in the academy at any one time. Children of career members of the regular and reserve components of the armed forces may compete for 100 Presidential vacancies each year. Eighty-five vacancies are available to qualified enlisted members of the Regular Air Force and eighty-five are also available to qualified enlisted members of reserve components of the Air Force. Qualified children of deceased veterans or qualified children of veterans who are 100 percent disabled are eligible to receive an appointment. Nominated students of honor military and naval preparatory schools and nominated members of the Air Force Reserve Officers Training Corps and the

Air Force Junior Reserve Officer Training Corps may compete for an appointment. Qualified children of Medal of Honor winners may be appointed without regard to vacancies. Fifteen hundred cadets are admitted each year around July 1. The Federal government pays their educational and living expenses for the four years.

Curriculum and Accreditation. The academy curriculum offers many opportunities and challenges, and provides a general education in the sciences and liberal arts, to equip all graduates with a broad background necessary to meet a variety of situations in their Air Force careers. The curriculum offers 21 academic majors, enrichment courses, and graduate programs. They receive an indoctrination into Air Force flying and may participate in extracurricular flight programs. Graduates receive a B.S. degree and a commission as a second lieutenant in the Regular Air Force, and those who are physically qualified go on to pilot training after graduation. They must serve at least five years in the regular armed forces.

The Air Force academy is regionally accredited by the North Central Association of College and Secondary Schools, and professionally accredited in aeronautical engineering, civil engineering, electrical engineering, engineering me-

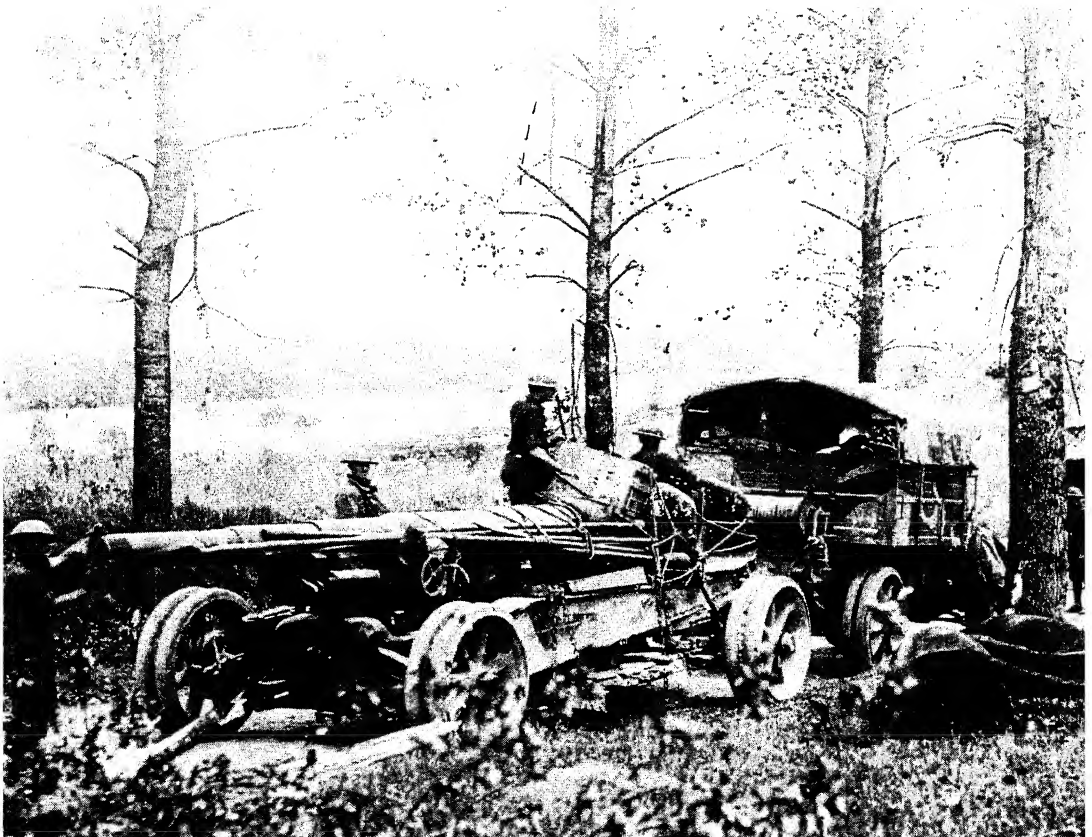
chanics, engineering sciences, and chemistry. In the mid-1970's the total authorized enrollment of the academy was 4417; the faculty numbered about 550. The academy library contained 460,000 bound volumes.

DEPARTMENT OF THE AIR FORCE

UNITED STATES ARMY, military force of the United States, consisting of the active army, the Army National Guard, and the Army Reserve and organized, trained, and equipped primarily for sustained combat on land. Other functions of major importance include civil defense, the civil works program of the U.S. Army Corps of Engineers (see ENGINEERS, CORPS OF), and the occupation of territory abroad.

The active army consists of the headquarters, in the Pentagon, Washington, D.C.; ten major subordinate commands (commands directly controlled by the Department of the Army); and five tactical commands (combat forces that are components of unified commands) under the operational control of the Department of Defense; see DEFENSE, DEPARTMENT OF. The headquarters consists of a secretary of the army, responsible for all affairs of the department, his deputy the under secretary, and four assistant sec-

A U.S. Army field artillery corps in action in France during World War I.
U.S. Army





Above: Soldiers of the 43rd Division Chemical Warfare Service attack a Japanese position on a Pacific island during World War II. Below: A Special Forces team of guerrilla-warfare specialists in a peacetime maneuver to test the combat readiness of the U.S. Strike Command.

U.S. Army



retaries, all civilians appointed by the President. The areas of interest of the assistant secretaries are financial management, installations and logistics, manpower and reserve affairs, and research and development. Special officers exist for civil defense, legislative liaison, administration, and public information. The army staff, controlled by the army chief of staff, provides professional assistance to the secretary and his staff and is responsible for personnel, plans, and operational readiness of the army. In a dual role, the chief of staff is also a member of the Joint Chiefs of Staff of the Department of Defense and participates in strategic plans and operations of the armed forces.

Commands. The *Forces Command*, at Fort McPherson, Ga., is responsible for all combat readiness activities and supervises all active army, reserve, and national guard combat units in the continental U.S., Puerto Rico, and the Virgin Islands. For these purposes the U.S. is geographically divided into three army areas and the Military District of Washington. The *Training and Doctrine Command*, at Fort Monroe, Va., directs all army education and training programs. The command also supervises basic

training, Reserve Officers Training Corps programs, and the army schools system. The *Army Matériel Command*, at Washington, D.C., performs matériel functions: procurement, research and development, production, and distribution of supplies. The *Strategic Communications Command*, at Fort Huachuca, Ariz., directs and controls army telecommunications elements that operate worldwide radio, wire, and cable facilities. The *Military Traffic Management and Terminal Service*, in Washington, D.C., consolidates the management and operations of military traffic, land transportation, and common-use ocean terminal traffic to eliminate duplicate transportation facilities of the armed forces. The *Intelligence Command*, at Fort Meade, Md., controls counterintelligence activities in the continental U.S. and conducts personnel security investigations of individuals requiring access to classified information. The *Army Recruiting Command*, at Fort Monroe, Va., directs all army recruiting activities. The *Criminal Investigation Command*, at Washington, D.C., directs all army investigative services. The *Computer Systems Command*, at Fort Belvoir, Va., designs, develops, tests, installs, and maintains multi-

A mine-clearing snake, developed by the U.S. Army Engineering and Development Laboratories, which is considerably more effective than the version used in World War II.

U.S. Army



UNITED STATES ARMY

command data processing systems. The *Health Services Command*, at Fort Sam Houston, Texas, directs all army medical programs.

The army components of the unified commands are the U.S. Army, Europe; U.S. Army, Pacific; U.S. Army, Alaska; U.S. Army, Southern Command; and the U.S. Army Air Defense Command. Many independent battalions (about 850 men) and brigades (about 2100 men) are in these combat forces but the normal combat unit is the division commanded by a major general. Depending on its type (infantry, airmobile, armored, airborne), a division has about 16,500 officers and men organized into three brigades, a support brigade, and division artillery. Other supporting elements include cavalry, signal, engineer, ordnance, chemical, transportation, and medical units. The Army National Guard and the Army Reserve, organized like the active army, provide additional trained forces available for active duty in time of war or national emergency.

History. The U.S. Army was conceived on June 14, 1775, when the Second Continental Congress (see CONTINENTAL CONGRESS), heeding the appeal of the Massachusetts Provisional Congress, adopted the New England army of militiamen as the continental army, called for ten additional volunteer companies, and a day later placed George Washington (q.v.) in command. In 1776 the Continental Congress appointed a Board of War and Ordnance, which is the germ from which grew the Headquarters, Department of the Army. After the American Revolution (q.v.), Henry Knox (q.v.) served (1785–94) as the first secretary of war. He was responsible for establishment, maintenance, equipment, and operations of an authorized army of 960 officers and men. By 1796, in response to war with the Miami (q.v.) Indians, the army had been increased to 3324 men, reinforced somewhat by provisions of the Militia Act of 1792, which made all able-bodied male citizens between the ages of 18 and 45 potential members of the militia.

During the 19th century, as the U.S. grew, army organization, strength, and effectiveness changed frequently to meet the many demands required by a country with national interests stretching from the North Atlantic through the Caribbean Sea and across the Pacific to the Orient. The United States Military Academy (q.v.) was established in 1802. By the end of the 19th century the army had participated in 91 principal wars, expeditions, campaigns, or occupations. The principal military conflicts were the War of 1812, the Mexican War (qq.v.), the Amer-

ican Civil War (see CIVIL WAR, THE AMERICAN), the Spanish-American War (q.v.), and the Philippine Insurrection (see PHILIPPINES: History). Moreover, during this period the army was involved in Indian wars (q.v.), protecting the western pioneers, exploring, and the building of roads, forts, and seacoast facilities. See FRÉMONT, JOHN CHARLES; LEWIS AND CLARK EXPEDITION.

By the turn of the 20th century the organizational structure of the army was considered archaic and at the suggestion of Secretary of War Elihu Root (q.v.) a general staff for planning, with a chief of staff as its head, was established, at the same time placing the commanding general of the army in a subordinate role. The Army War College was established shortly thereafter to prepare senior officers for high command; see NATIONAL WAR COLLEGE.

Peacetime undertakings of the army before World War I (q.v.) included the occupation of Cuba (see CUBA: History), to restore political and economic stability; the army pioneered here in the research and discovery of the cause of yellow fever (q.v.). Also, the army was made responsible for the construction of the Panama Canal (q.v.), made possible only after the medical corps had eliminated malaria (q.v.) and yellow fever in the infested area.

The National Defense Act of 1920 brought about further changes in military organization and structure. It established three army components, the Regular Army, the National Guard, and the Organized Reserves with each to share a part of the burden in the event of a war. The training of the reserve components was made a responsibility of the Regular Army. Additionally, the Army Air Service (see AIR FORCE, DEPARTMENT OF THE) and chemical and finance branches were officially established.

In 1924 the Army Industrial College (now the Industrial College of the Armed Forces), in Washington, D.C., was created to acquaint senior officers with global logistic functions and their relation to military affairs. Thus, by the outbreak of hostilities in Europe on Sept. 1, 1939, the training and organizational base of the army was far advanced. With war imminent, the Selective Service and Training Act of Sept. 16, 1940, required, for the first time in the history of the U.S., men to serve in a peacetime army; see SELECTIVE SERVICE. By the time the U.S. was drawn into World War II (q.v.), the army had been increased from a strength of 190,000 officers and men to more than 1,600,000. It reached a personnel peak of 8,268,000 military and 1,881,000 civilians serving in one capacity or another, including personnel in the Women's Army Corps,

UNITED STATES COAST GUARD

which was established on May 14, 1942.

The National Security Act of 1947 was, as in the case of all other major changes, the result of wartime experiences. The introduction of massed air power and the atomic bomb required that the military forces fight as unified forces as was accomplished informally during the war. The act abolished the Department of War (see WAR, DEPARTMENT OF), establishing the Department of the Army. The army chief of staff was made a member of the newly established Joint Chiefs of Staff and the Army Air Force was made an independent service. Further changes in the act in 1949 deprived the secretary of the army of membership in the Cabinet (q.v.), and the Department of Defense Reorganization Act of April 3, 1958, established a chain of command from the President as commander-in-chief through the Department of Defense to the commanders of the unified and specified commands on operational matters, bypassing the military departments. The secretary is kept closely informed by the secretary of defense and the chief of staff as a member of the Joint Chiefs, however.

See also EDUCATION, MILITARY; SPECIAL FORCES.

H.M.L.

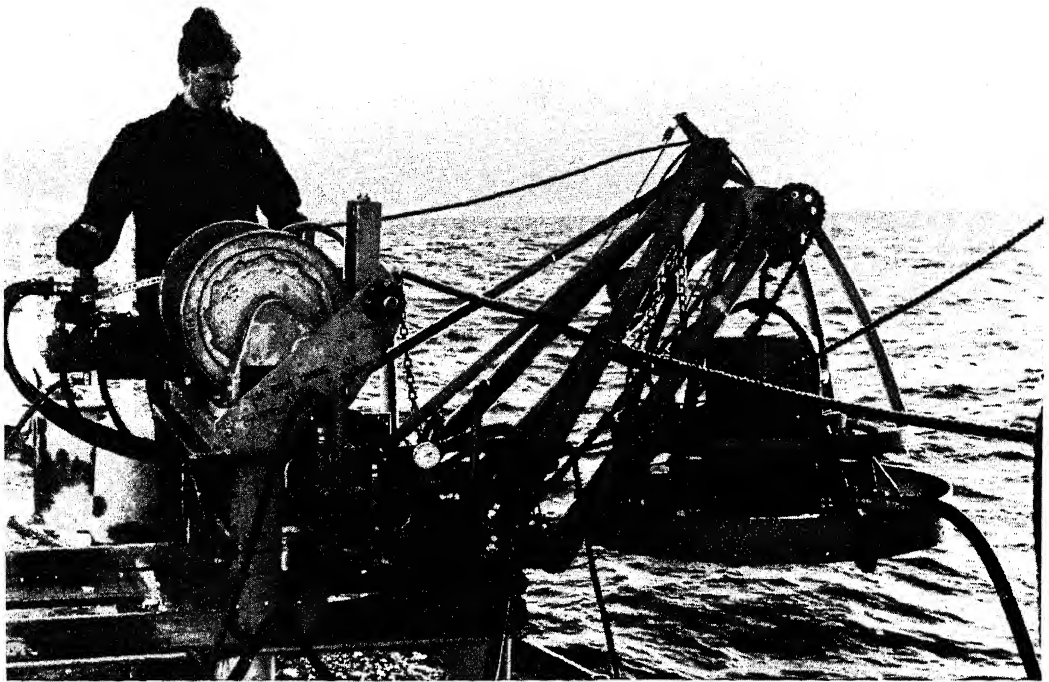
UNITED STATES COAST GUARD, military service and one of the armed forces of the United States, dating from Aug. 4, 1790, when Congress authorized the construction of "ten boats for the collection of revenue". First known as the Revenue Marine, it later became the Revenue Cutter Service; in 1915 the latter was combined with the Life Saving Service into a single organization called the United States Coast Guard. In 1939 the coast guard assumed control of the Lighthouse Service; and in 1942 temporarily, and in 1946 permanently, took over the functions of the Bureau of Marine Inspection and Navigation.

The coast guard operated as a part of the Department of the Treasury until transferred to the newly created Department of Transportation on April 1, 1967. The primary missions of the coast guard continue to be enforcement of maritime law and the protection of life and property at sea. In time of war or on direction of the President it serves as part of the United States Navy, besides carrying out its traditional peacetime duties.

The icebreaker Westwind leads a Danish freighter through 50 mi. of ice to deliver supplies to starving Eskimos in Greenland.

U.S. Coast Guard





The icebreaker Northwind participates in oceanographic investigations in the arctic seas to collect data that will be used by scientists to measure the thickness and composition of the earth's crust. U.S. Coast Guard

The coast guard is headed by a commandant, a full admiral, supported by an assistant commandant, a vice-admiral; a chief of staff; a headquarters organization; and two area commanders, rear admirals, who coordinate the activities of twelve administrative district offices in the continental U.S. and Hawaii, each headed by a rear admiral.

Ranks and rates are identical in the coast guard and the navy. Navy facilities are frequently used in coast guard training programs, and the coast guard takes part in fleet exercises with the navy. The coast guard maintains an academy at New London, Conn., from which it draws the bulk of its career officers; see UNITED STATES COAST GUARD ACADEMY.

The Coast Guard Reserve, established in 1939, provides a reservoir of trained officers and men in time of emergency. The Coast Guard Auxiliary, founded in 1941, is a nonmilitary, volunteer organization dedicated to promoting safe boating practices. It assists the coast guard in rescue operations, patrols outdoor marine events, and carries on a program of public education. The Women's Coast Guard Reserve, called SPARS from the first letters of the coast-guard motto

Semper Paratus and its English translation "Always Ready", was formed in 1942. Its members are trained to perform shoreside tasks, relieving men for sea duty in time of emergency.

Early in 1974 coast guard active strength included 38,000 officers and enlisted personnel, 266 cutters, 2000 smaller boats, 108 helicopters and 50 aircraft, 650 shore units, and 173 lighthouses.

Among the peacetime functions of the coast guard are enforcement of maritime laws and treaties; protection of life and property on the high seas, on the coast, and in inland flood disasters; enforcement of customs and revenue laws and prevention of smuggling; maintenance of weather stations at sea; oceanographic research; safeguarding of navigation on the high seas and in port; enforcement of antipollution laws; establishment and supervision of loading operations; icebreaking operations; and inspection of merchant vessels and supervision of boat safety standards. The coast guard maintains a global network of aids to navigation, including lighthouses; carries out offshore patrols; and maintains air detachments on the coast, on the Great Lakes, and overseas.

The wartime role of the coast guard is primarily logistic, including convoy escort, coastal and offshore patrols, port safety operations, operation of transports and invasion craft, and par-

ticipation in antisubmarine and amphibious landing operations. The coast guard has served in every major war involving the U.S.

UNITED STATES COAST GUARD ACADEMY, Federal educational institution maintained to educate and train young men to be officers of the United States Coast Guard, located in New London, Conn. Formal cadet training began in 1876 on the *Dobbin*, a topsail schooner with winter quarters at New Bedford, Mass. The school moved to Arundel Cove, Md., in 1900 and in 1910 to Fort Trumbull overlooking New London harbor. The school received its present name in 1915. In 1932, the academy moved to its present location 2 miles north of New London on the Thames R.

As of 1973 the academy had 1000 cadets selected in a nationwide competitive examination. Any physically qualified unmarried male citizen of the U.S. between the ages of seventeen and twenty-two may apply for admission. Those selected agree to serve a minimum of five years after graduation.

Cadets receive food and lodging and monthly pay to cover expenses. The academy is accredited and offers a diversified, four-year curriculum including seamanship and navigation, physical sciences, engineering, social sciences, and humanities. Much of the professional training takes place at sea in the summers aboard the three-masted barkentine *Eagle* and on Coast Guard cutters. The program leads to a B.S. degree and a commission as ensign.

In 1973 the library of the academy contained over 100,000 bound volumes and the faculty numbered 117 members.

UNITED STATES INFORMATION AGENCY, agency of the Federal government, created in 1953 and known as the U.S.I.A. Its mission is to make the actions and policies of the United States understandable to the people of other countries and to advise the U.S. government on policy implications of foreign opinions. The director of the Agency is appointed by the President, with the advice and consent of the Senate.

The U.S.I.A. maintains more than 200 posts in 105 countries, where they are known as the U.S. Information Service, or U.S.I.S. In addition to informational activities, the U.S.I.A. is responsible for U.S. cultural efforts abroad, such as libraries, binational centers, and East-West exhibitions. Agency headquarters are in Washington, D.C. From there, the agency operates its broadcasting service, the Voice of America.

See PROPAGANDA: *Cold War Propaganda*.

UNITED STATES MARINE CORPS, branch of the armed forces and an integral part of the De-

partment of the Navy under the direct control of the secretary of the navy; see NAVY, DEPARTMENT OF THE; UNITED STATES NAVY. Marines are trained and equipped primarily to carry out amphibious operations. The corps is headed by a commandant, who holds the rank of general and is appointed to a four-year term by the President with the advice of the United States Senate. When the Joint Chiefs of Staff are considering matters that directly concern the corps, the commandant has coequal status with the other members.

The Marine Corps headquarters staff, headed by the chief of staff, includes three major departments—manpower, installations and logistics, and plans and operations—and eleven separate divisions. Separate offices include the legislative assistant, general counsel, staff judge advocate, medical officer, dental officer, and chaplain.

Marine detachments serve aboard major ships of the United States Navy and as security detachments at naval bases in the U.S. and at installations of the North Atlantic Treaty Organization (q.v.) and U.S. embassies abroad. Members of the corps are known popularly as leathernecks, from the leather cravat once a part of the marine uniform. Their motto is *Semper Fidelis* ("Always Faithful"), and the corps hymn is "From the Halls of Montezuma to the Shores of Tripoli". As of January, 1974, the number of marines on active duty was officially estimated at 192,000, organized into two fleet marine forces and three aircraft wings.

History. A force of two battalions of marines was authorized by the Continental Congress on Nov. 10, 1775. By 1784, Continental Marines had been inactivated, but a corps of marines was established by Congress on July 11, 1798. The authorized strength was set at 881 men.

During the 19th century, the Marine Corps played an important role in every major conflict, including operations against French privateers along the U.S. coast, the War of 1812, the Mexican War, landings in Japan, China, and the nations of Latin America, the American Civil War, the Spanish-American War (q.v.), and the Boxer Rebellion in China.

The strength of the corps increased from 10,000 in 1916 to 78,839 during World War I, and artillery and aviation units were added. Marines served aboard ships of the fleet and in France. The brave work of the 4th Marine Brigade at Château-Thierry and in Belleau Wood brought the corps worldwide fame; see BELLEAU WOOD, BATTLE OF; WORLD WAR I: *The Campaigns and Other Events of 1918*. Total marine casualties in



Men of the Fourth Marine Regiment patrol the demilitarized zone in Vietnam.
U.S. Marine Corps

the war were 2851 dead and 9520 wounded.

The strength of the corps on Dec. 7, 1941, was 66,576 and during World War II grew to a peak of 669,100, with six divisions, four air wings, and supporting units. Marines fought gallantly in all the Pacific campaigns, notably at Guadalcanal, elsewhere in the Solomon Islands, in the Gilbert Islands, and on Okinawa (qq.v.), defeating the enemy in some of the most furious battles in American military annals; see IWO JIMA, BATTLE OF; TARAWA. Marine casualties in the war totaled 97,718, including 19,733 men killed in action. During the Korean War (q.v.), the corps suffered 29,272 casualties, including 4267 combat deaths.

In March, 1965, a force of 20,000 marines was landed in South Vietnam from ships of the Seventh Fleet, the first combat troops to arrive in the country. By March, 1969, the number of marines in South Vietnam had grown to more than 81,000. The majority were located in the five northernmost provinces of South Vietnam bordering the demilitarized zone between the two Vietnams. Total marine casualties in Vietnam were 12,944 killed and 88,593 wounded. See VIETNAM, WAR IN.

The Marine Corps Women's Reserve was established during World War I; it was reinstituted in 1943, during World War II. In 1948 the Armed Forces Integration Act established the women marines as a permanent component of the corps. As of January, 1974, the women marines totaled 310 officers and 2050 enlisted women.

See WOMEN IN THE MARINE CORPS.

UNITED STATES MARITIME COMMISSION.

See FEDERAL MARITIME COMMISSION.

UNITED STATES MERCHANT MARINE. See MERCHANT MARINE OF THE UNITED STATES.

UNITED STATES MERCHANT MARINE ACADEMY. See MERCHANT MARINE OF THE UNITED STATES: *Government Regulation*.

UNITED STATES MILITARY ACADEMY, national military college at West Point, N.Y., maintained to train and educate young men and women to be officers in the United States Army (q.v.). The academy was founded by Congress in 1802. Women were first admitted in 1976.

The maximum authorized cadet strength is 4417. Appointments are made as follows: Congressional cadetships include 5 allocated to the Vice-President, 5 to each Senator and member of Congress, 5 to the delegate to Congress of the District of Columbia, 1 each to the governors of the Panama Canal Zone, Guam, the Virgin Islands, and American Samoa, and 6 to the resident commissioner from Puerto Rico. Military service cadetships, allocated to the secretary of the army, fall into categories with maximum annual appointments as follows: Presidential, 100; members of Regular Army, 85; members of Army Reserve, 85; graduates of honor military and honor naval schools and Reserve Officers Training Corps (R.O.T.C.), 20; sons and daughters of deceased or totally disabled veterans, 10; sons and daughters of persons awarded the Medal of Honor, unlimited number. Appointments to vacancies are awarded on a competitive basis.

UNITED STATES NAVAL ACADEMY

If the number of appointed candidates does not fill the available vacancies, the academy's academic board selects qualified candidates who failed to receive an appointment from a national waiting list based on order of merit. Candidates must be unmarried U.S. citizens between seventeen and twenty-two years of age, physically fit, and of high moral character. Qualified young men and women from the Republic of the Philippines, the Latin American republics, and other allied nations are also admitted under specified conditions.

The four-year course at the academy covers the sciences and humanities; military training is conducted primarily during the summer. Upon graduation, a cadet is awarded a B.S. degree and a commission as second lieutenant in the Regular Army. In the mid-1970's the number of cadets was about 4200, the staff and faculty numbered about 700 officers and civilians, and the library contained more than 400,000 bound volumes.

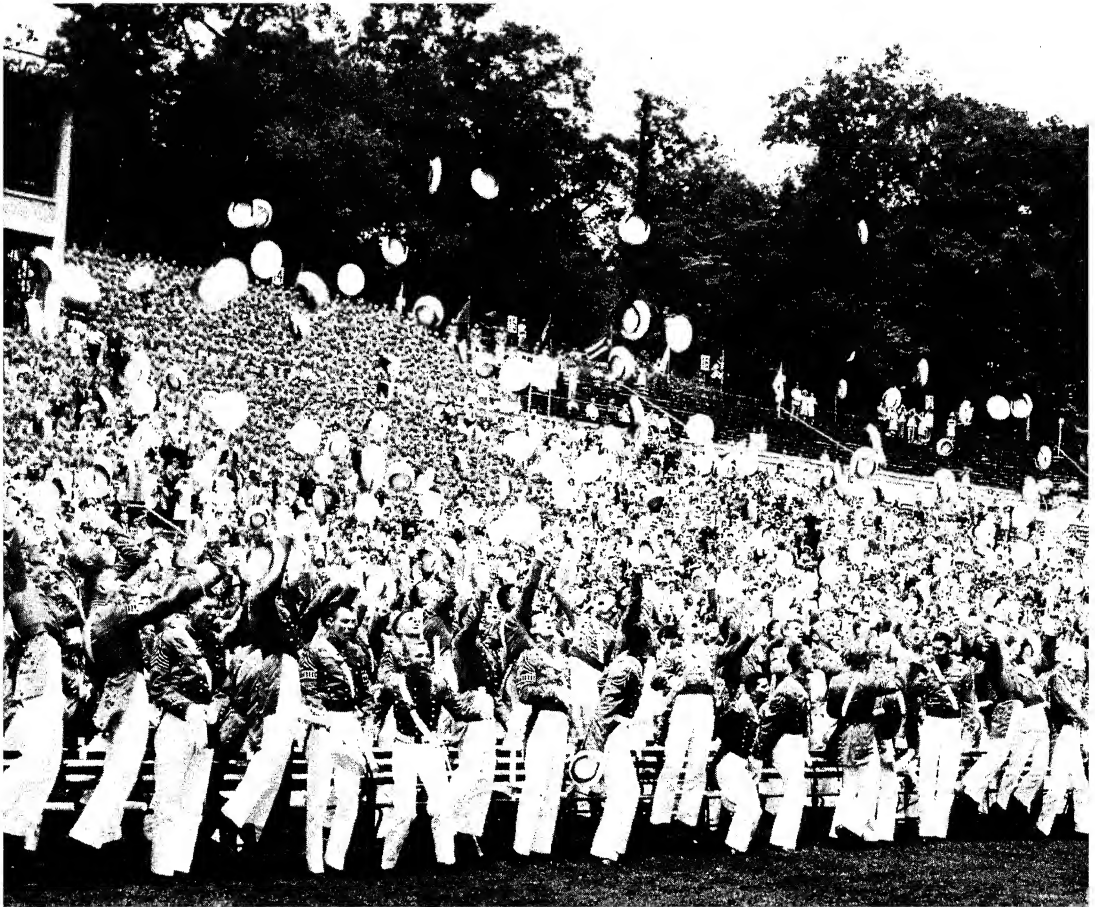
UNITED STATES NATIONAL MUSEUM. See SMITHSONIAN INSTITUTION.

UNITED STATES NAVAL ACADEMY, undergraduate college that educates young men and (since 1976) women to be officers in the United

States Navy and United States Marine Corps (qq.v.). It was founded as the Naval School in 1845 and is located in Annapolis, Md.

The approximately 1350 candidates appointed to the school each year are selected as follows: United States Senators and Representatives, the Vice-President of the United States, the delegate to Congress from the District of Columbia, and the resident commissioner of Puerto Rico may each have a maximum of five midshipmen at the academy at any one time and may nominate up to ten candidates for each vacancy. The President of the United States annually appoints 100 midshipmen from among qualified sons and daughters of certain active and retired regular or reserve military personnel and makes additional appointments to maintain up to 65 sons and daughters of prisoners of war, of those missing in action, and of deceased or disabled veterans at the academy. The secretary of the navy annually appoints 170 qualified candidates from regular and reserve components of the Navy and Marine Corps, 10 from college Naval Reserve

Cadets of the U.S. Military Academy throw their hats in the air in a traditional gesture at the end of graduation exercises at West Point.
U.S. Army



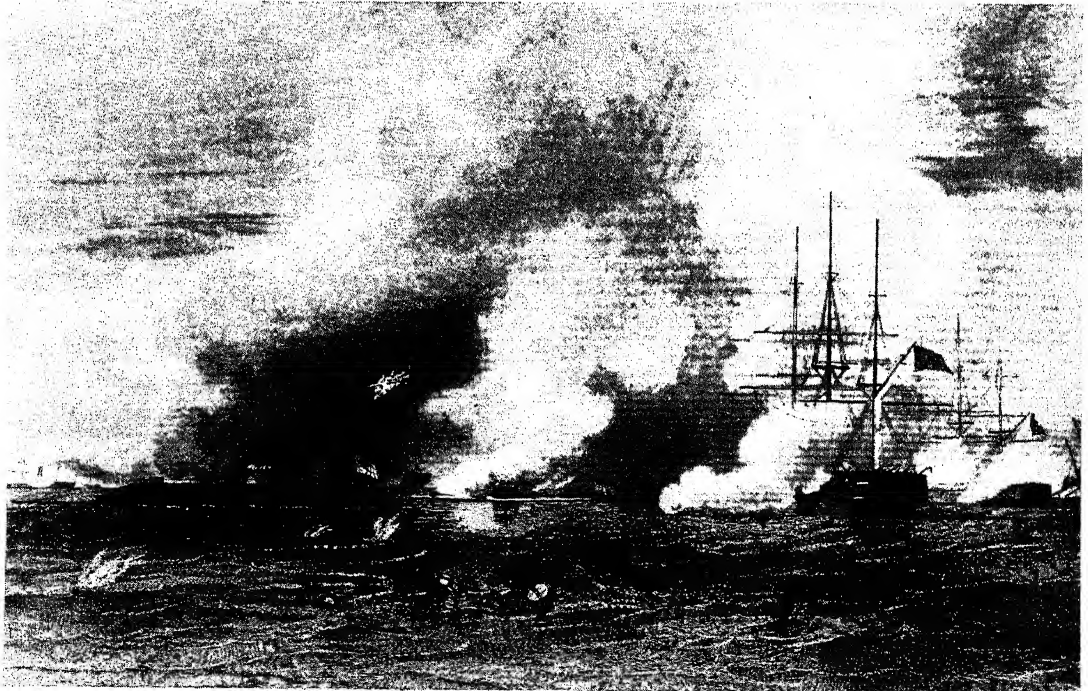
UNITED STATES NAVAL ACADEMY

Officers Training Corps units, and 10 from among honor graduates of designated honor naval and military schools. Appointments are available to qualified sons and daughters of Medal of Honor winners and, in limited numbers, to candidates from the Panama Canal Zone, Guam, the Virgin Islands, American Samoa, the Philippines, and Latin American republics. All appointees must be U.S. citizens (except those authorized from foreign countries), of good moral character, in good physical condition, single, and between the ages of seventeen and twenty-two on July 1 of the year of entry. They must score acceptably in either the College Entrance Examination Board (C.E.E.B.) scholastic aptitude test or the American College Testing Program (A.C.T.) test, and must have acceptable secondary school and college records.

The four-year program includes courses in science, naval science, engineering, mathematics, social sciences, and the humanities. Graduates receive a B.S. degree and are commissioned as ensigns in the Navy or second lieutenants in the Marine Corps.

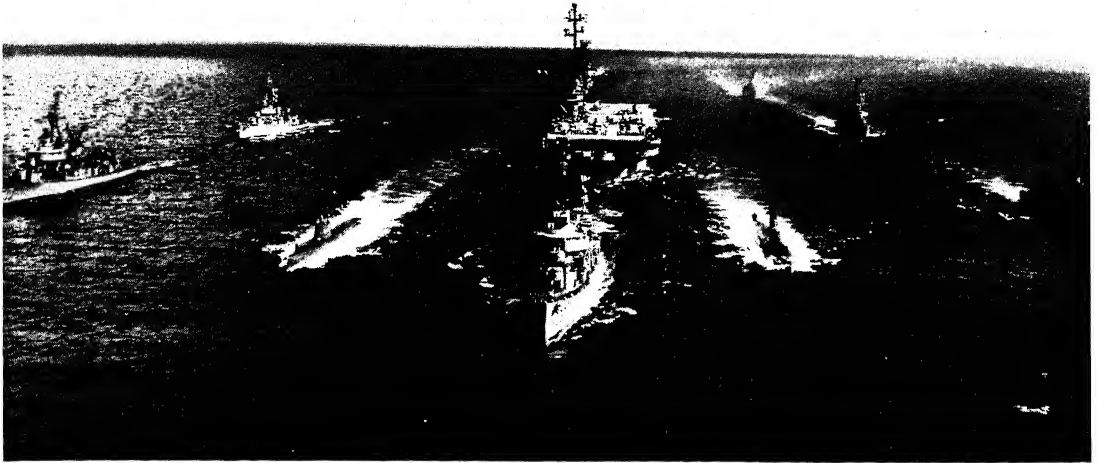
In the late 1970's about 4350 midshipmen attended the academy, the faculty numbered 550, and the library had 495,000 bound volumes. The academy museum was founded in 1845.

Action between the Union and Confederate armored vessels Monitor and Merrimac during the Civil War.
U.S. Navy



UNITED STATES NAVY, permanent naval force of the United States, established as the Department of the Navy by act of Congress on April 30, 1798; see NAVY, DEPARTMENT OF THE. The U.S. Navy is separately organized under the secretary of the navy but operates under the authority of the secretary of defense. The United States Marine Corps (q.v.) is part of the U.S. Navy, which also includes the United States Coast Guard (q.v.) on those occasions when it is placed under the Navy, usually during wartime. The Navy's mission is to organize, equip, train, and maintain naval and marine forces for territorial defenses, and for other missions assigned by the President or the department of defense. In late 1973 the Navy had approximately 564,000 active-duty personnel, plus some 191,000 personnel in the U.S. Marine Corps.

The personal staff of the secretary of the navy, a Presidential appointee, is analogous to that of the other military departments, and includes an under secretary and assistant secretaries for installations and logistics, manpower and reserve affairs, financial management, and research and development. In addition, there are offices for naval matériel research, legislative affairs, information, program appraisal, naval petroleum and oil shale reserves, and administration. The navy also has a judge advocate general, a comptroller, and a general counsel. The chief of naval operations heads the Department of the Navy's pro-



fessional staff, is a member of the Joint Chiefs of Staff, and is responsible to the secretary for the readiness of all naval forces, except the marines, which are a responsibility of the commandant of the Marine Corps.

Commands. Eighteen commands, bureaus, or offices provide support or services to the operating naval and marine forces. The Naval Matériel Command, with 6 subordinate commands, is responsible for matériel support of the operating forces, and the Military Sealift Command provides ocean transportation for personnel and cargo of all military services. Naval commands for communications, intelligence, weather, security, personnel, oceanography, training, and medicine also exist. The United States Naval Academy (q.v.) prepares cadets for careers as naval officers. The secretary of the navy and the chief of naval operations extend administrative control and supervision to forces through fourteen naval districts. Among the geographical headquarters of these districts are Boston, Mass.; Norfolk, Va.; Charleston, S.C.; Great Lakes, Ill.; San Diego, Calif.; Pearl Harbor, Hawaii; Seattle, Wash.; and San Juan, Puerto Rico.

The seven unified commands (see DEFENSE, DEPARTMENT OF) in which the U.S. Navy has components are the Continental Air Defense, Alaskan,

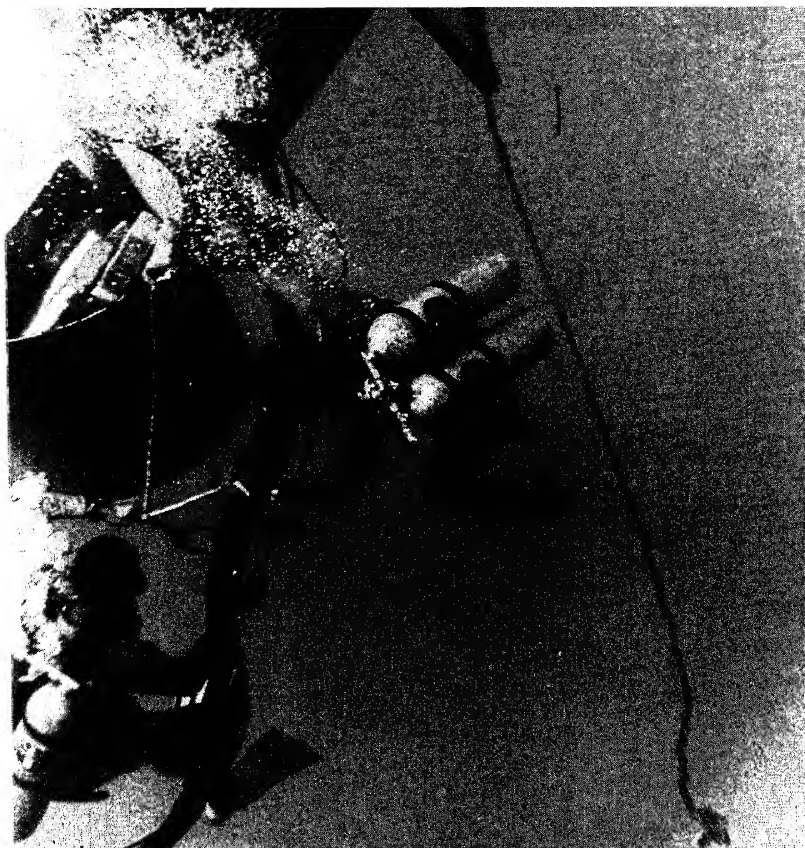
An antisubmarine-warfare task group, comprising an aircraft carrier, seven escort destroyers, two submarines, and naval air-support units, conducts exercises in Atlantic waters.

U.S. Navy

European, U.S. Southern, Pacific, Atlantic, and U.S. Readiness commands.

In late 1973 the Navy had 520 ships and 14 air wings, plus reserve forces. The active operating forces of the Navy include the Atlantic and Pacific fleets. There are 270 ships in the Atlantic Fleet. The combat elements include 6 aircraft carriers, 48 attack submarines, 31 nuclear-powered fleet ballistic-missile submarines, and 17 air wings. Part of this force is in the Sixth Fleet on sea duty in the Mediterranean Sea; the remainder is in the Second Fleet that has its headquarters at Norfolk, Virginia. In the Pacific Fleet there are 250 ships. The combat elements include 8 aircraft carriers, 36 attack submarines, 10 nuclear-powered fleet ballistic-missile submarines, and 8 air wings. The Pacific Fleet is divided into the Seventh Fleet on sea duty in the Western Pacific and the Pearl Harbor-based Third Fleet.

History. The Continental Navy of approximately 3300 personnel and 60 vessels was formed on October 13, 1775, from elements of naval units of the original thirteen colonies, and



Navy divers make final adjustments to the umbilical supply line before the lowering of an under-sea laboratory off Bermuda.
U.S. Navy

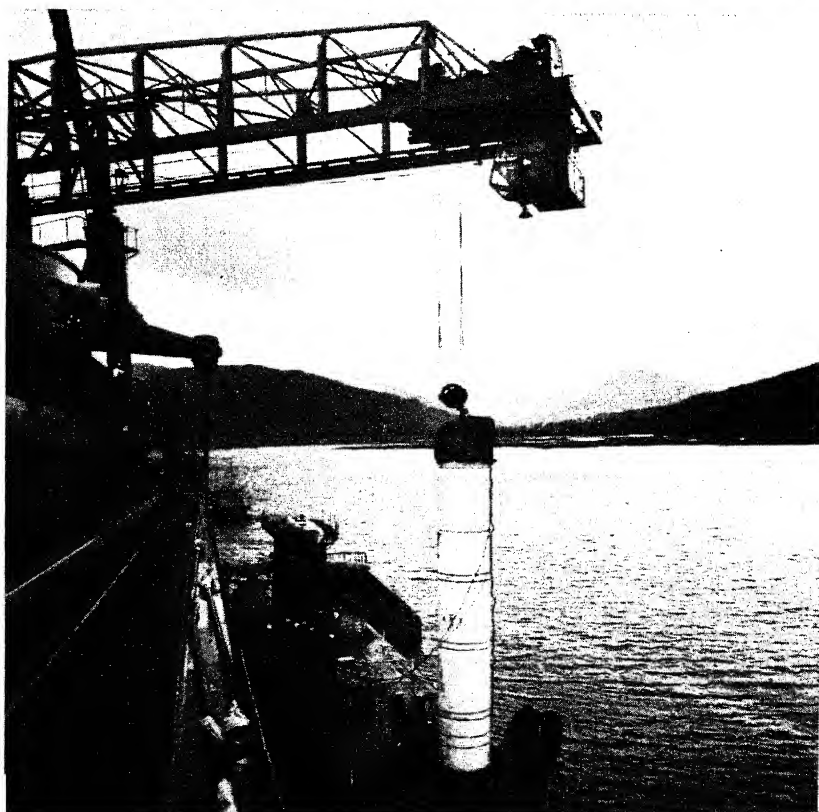
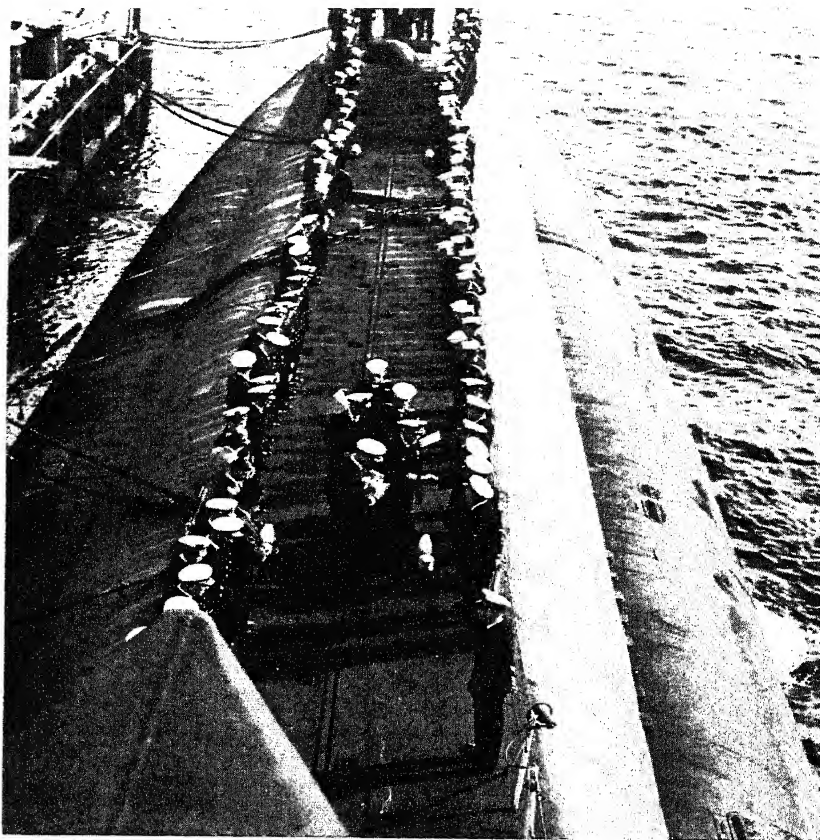
although disbanded after the American Revolution (q.v.), was the forerunner of today's Navy. It had as its primary purpose the harassment of the British Navy where possible and the transportation of troops and supplies to the Continental Army. In 1794 naval forces were again activated when Congress authorized 6 frigates to protect American interests on the Barbary Coast (q.v.), and on April 30, 1798, Congress established the Department of the Navy; prior to this time naval matters were under the secretary of war established by Congress on August 7, 1789.

British and French manipulation of American commerce on the high seas culminated in the War of 1812 (q.v.) and contributed to increased American naval strength. By the end of the War of 1812 the U.S. Navy had been enlarged to 77 vessels and approximately 8700 men. The Navy later assisted in the acquisition of California and transported troops and supplies to Mexico during the Mexican War (q.v.). More importantly, the American naval officer Commodore Matthew Calbraith Perry (see *under* PERRY) sailed to Japan in 1853 and, with a show of force and adroit diplomacy, negotiated "favored nation" trade agreements with Japan, marking the end of Japan's centuries old policy of isolation. Dur-

ing the American Civil War the Union Navy blockaded (see BLOCKADE) the coastline of the Confederate States. In an attempt to break the blockade the Confederacy built the ironclad *Merrimac* (q.v.) and the Union Navy responded by building the *Monitor* (q.v.). The introduction of these ironclads foreshadowed the end of wooden naval ships. See CIVIL WAR, THE AMERICAN.

After the defeat of the Spanish Fleet in the Spanish-American War (q.v.) the U.S. was a leading naval power and joined other countries in scientific and arctic area explorations, culminating in the discovery of the North Pole by Admiral Robert Edwin Peary (q.v.) on April 6, 1909. The increased importance of the Navy was reflected in the appointment of a chief of naval operations in 1915. During World War I (q.v.) the Navy's primary mission was territorial defense, protection of American commerce and transportation of troops and supplies to France. This role, greatly expanded, was continued in World War II (q.v.), and the Pacific Fleet played a vital role in the defeat of the Japanese. During the Korean War (q.v.) the Navy provided marines for ground combat and naval air support from carrier-based aircraft, as well as transporta-

Submarines, a formidable factor in naval warfare. Above: Awards are presented to officers and men of the U.S.S. Triton, which in 1960 completed the first submerged circumnavigation of the world. Below: A missile from the U.S.S. George Washington, stationed in Scotland, is checked by the tender Hunley.



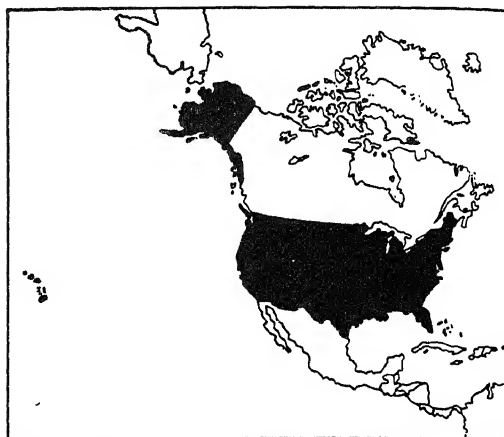
UNITED STATES OF AMERICA, THE

tion of troops and supplies for the participating United Nations Allies.

The Navy pioneered and perfected the world's first nuclear-propelled vehicle, the submarine *Nautilus*, which was commissioned in 1954. Since then nuclear propulsion has been added to other ships of the fleet, including aircraft carriers. Today the Navy is active in exploration of the ocean's floor and has established a special office to coordinate its underwater research efforts. Naval and Marine personnel are also assigned to the National Aeronautical Space Agency (q.v.), and Naval commanders Charles P. Conrad and Alan L. Bean (qq.v.) made the second moon landing in 1969; see *ASTRONAUTICS*.

UNITED STATES OF AMERICA, THE, popularly referred to as **THE UNITED STATES** or as **AMERICA**, a Federal republic of the North American continent, consisting of forty-eight contiguous States and the noncontiguous States of Alaska and Hawaii. The U.S. mainland of forty-eight States is bounded on the N. by Canada, on the E. by the Atlantic Ocean, on the S. by the Gulf of Mexico, and on the W. by the Pacific Ocean. The N. boundary is partly formed by the Great Lakes and the Saint Lawrence R.; the S. boundary is partly formed by the Rio Grande. Unless otherwise noted, the designations "U.S. mainland" and "United States", as used herein, refer to the forty-eight contiguous States.

The total area of the United States is 3,615,122 sq.mi., of which 3,022,260 sq.mi. are in the U.S. mainland, 586,412 sq.mi. in Alaska, and 6450 sq.mi. in Hawaii. Inland bodies of water occupy 78,267 sq.mi. of the total area of the U.S. The extreme N. and S. limits of the U.S. mainland are delineated respectively by lat. 49°23' N. and lat. 25°50' N.; the extreme E. and W. limits are delineated respectively by long. 66°57' W. and long. 124°44' W. Measured along the parallel of latitude that passes through West Quoddy Head, Maine, the easternmost point in the U.S., the maximum width of the country is approximately 2807 mi. The maximum length measured from the vicinity of Brownsville, Texas, due N. to the Canadian frontier, is about 1598 mi. The boundaries of the U.S. extend along the Atlantic and Pacific oceans, the Gulf of Mexico, and along land areas. The N. boundary is 3987 mi. long; the S. boundary, 1933 mi.; and the boundary between Alaska and Canada, 1538 mi. For the fifty States, the Atlantic coastline is 2069 mi.; the Pacific coastline, 7623 mi.; the Gulf of Mexico coastline, 1631 mi.; and the Arctic coastline of Alaska, 1060 mi. The geographic center of the U.S. mainland is situated in Smith County, Kans.,



The United States, including Alaska and Hawaii, located in relation to its neighbors. © C. S. Hammond & Co., Inc., Maplewood, N.J.

at lat. 39°50' N. and long. 98°35' W. Mount McKinley (20,320 ft.), in Alaska, is the highest point in North America; Death Valley, a depression 282 ft. below sea level, in California, is the lowest point. The average elevation of the U.S. is 2500 ft. above sea level.

THE LAND

The U.S. has many different physical features and a wide diversity of animal and plant life. Besides the discussion below, much information is given in separate articles on important mountains, rivers, lakes, and species of plants and animals. Natural resources of major significance are also discussed separately; for example, see *COAL*; *PETROLEUM*.

The U.S. may be divided into four major physiographic divisions, each running in a N.-S. direction. Moving from E. to W., these divisions are the Atlantic and Gulf Coastal Plain, the Appalachian Highland, the Interior Plains, and the Cordillera. See *NORTH AMERICA: The Land*.

The N. part of the Atlantic Coastal Plain is a narrow belt of rough and deeply eroded peninsulas with a large number of drowned river systems, that is, streams with deep, broad estuaries that form excellent harbors. Long Island, the largest off-lying island of the U.S., and several other large islands, notably Staten Island, Nantucket, and Martha's Vineyard, are disassociated fragments of the N. Atlantic Coastal Plain. The S. part of the Atlantic Coastal Plain is a wide lowland fringed by a chain of low, sandy islands. Swamps are common in the S. portion of the S. Atlantic Coastal Plain; see *EVERGLADES*; *OKENOCKEE SWAMP*.

The Gulf Coastal Plain, which forms the coastline of the Gulf of Mexico, is an extension of the

Atlantic Coastal Plain. This lowland region skirts the s. extremity of the Appalachian Highland, merging with the Interior Plains at the estuary of the Mississippi R. Extensive barriers and sand-bars lie offshore along the Gulf Coast.

The Appalachian Highland forms the watershed dividing the rivers that flow through the coastal plain to the Atlantic Ocean and those that flow into the Mississippi R. and, ultimately, to the Gulf of Mexico. The Highland, which extends from n. Maine to central Alabama, is an old mountain system so eroded as to have lost much of its original character. The e. limits of the Appalachian region are formed in the n. by the New England Upland and in the s. by the Piedmont, which extends through Virginia, North and South Carolina, and Georgia. The New England Upland is mountainous, but much of the Piedmont has been worn down to lowlands. Prominent among the Appalachian ranges are the White, Green, Adirondack, Blue Ridge, Great Smoky, and Black mountains. Except in the White and Black mountains, in which elevations above 5000 ft. occur, the uplifts of the system seldom exceed 3000 ft. Mount Mitchell (6684 ft.), in the Black Mts., is the highest summit on the e. coast. To the w. of these ranges the Appalachian Highland is traversed by a series of parallel valleys running in a general s.w.-n.e. direction. The main series of valleys, including the Hudson, Cumberland, and Shenandoah valleys, are known collectively as the Great Valley. The westernmost limits of the Appalachian Highland are the Allegheny and Cumberland plateaus, which contain vast deposits of coal, petroleum, and gas.

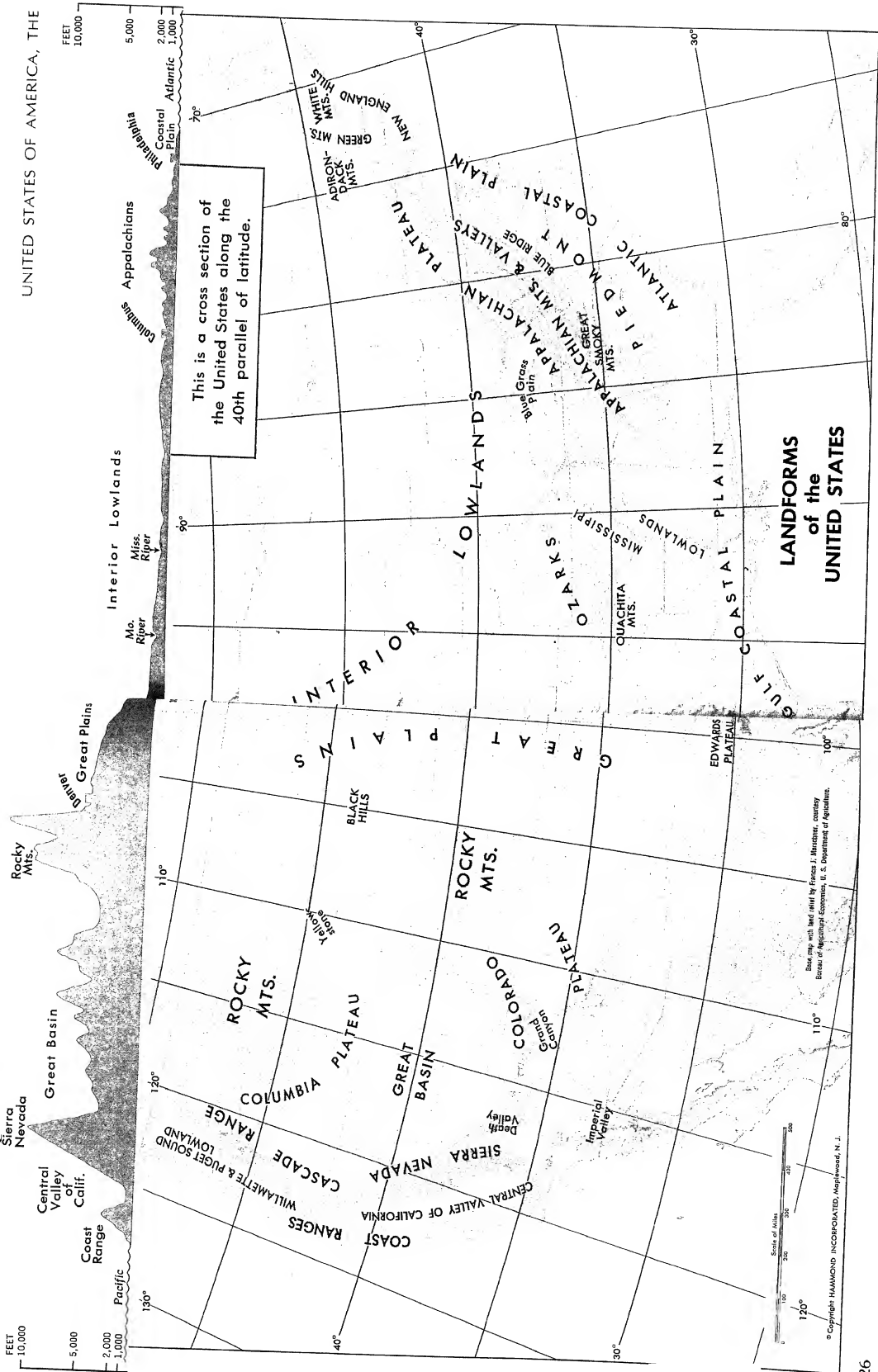
The Interior Plains, consisting mainly of the drainage basin of the Mississippi R., encompass about half the land area of the U.S. mainland and are the chief agricultural region of the country. Within the Interior Plains a central lowland occupies the region around all of the Great Lakes except Lake Superior and follows the course of the Mississippi R. southward to the point at which it merges into the Gulf plain. Much of this region shows the effects of glaciation. The s.e. part of the Interior Plains rises to a low plateau with a maximum elevation of 1400 ft., which abuts the higher Cumberland Plateau of the Appalachian Highland. The s.w. part of the Interior Plains also is an upland region, consisting of the Ozark Plateau and the Ouachita Mts. Elevations in these uplifts, which contain rich deposits of coal, bauxite, lead, and other minerals, rarely exceed 2000 ft. In the n., the region around Lake Superior, distinct from the Interior Plains, is a s. projection of an ancient rock

system known as the Canadian Shield, which extends down from Canada. It is a deeply eroded uplift, thickly forested and rich in iron and copper ore. West of the central lowland the Interior Plains encompass the Great Plains, which extend to the foothills of the Rocky Mts. This is a region of semiarid hills, peneplains, and prairies; it slopes upward from elevations of 1000 to 2000 ft. in the e. to between 5000 and 6000 ft. in the w. The level tracts are situated mainly in the s., and the n. is a region of peneplains with a scattering of domelike mountains, of which the largest group is the Black Hills.

The ranges of the Rocky Mts. form the backbone of the Cordilleran geological province. Numerous summits in these ranges are over 14,000 ft., including Mt. Elbert (14,433 ft.), Pikes Peak (14,110 ft.), and Longs Peak (14,256 ft.). Lying to the s.w. of the Rocky Mountain System is a vast tableland, commonly known as the Colorado Plateau. At its higher levels the Colorado Plateau averages about 5000 ft. in elevation. It is cut by deep canyons, particularly the Grand Canyon of the Colorado R. To the w. of the Rocky Mountain System and the Colorado Plateau lies the Great Basin, a region occupied by more than 100 minor mountain ranges and many undrained depressions, including the bed of the Great Salt Lake, Death Valley, and the Mojave Desert. To the n. of the Great Basin lies the Columbia Plateau, an extensive lava tableland with elevations ranging from 5000 ft. to less than 500 ft. in the w. The Blue Mts., an eroded outcropping with elevations up to 7000 ft., are in the east-central part of the Columbia Plateau.

The Sierra Nevada and its northward projection, the Cascade Mts., extend from s. California to the Canadian border. This system has a steep and lofty e. escarpment and contains several major summits, especially Mt. Whitney (14,494 ft.) and Mt. Shasta (14,162 ft.); a number of extinct volcanoes, notably Mt. Rainier (14,410 ft.) and Mt. Hood (11,235 ft.); and the only active volcano in the U.S., Lassen Peak (10,457 ft.). The Coast Range, the westernmost subdivision of the Cordilleran province, is a succession of low ranges in which few elevations exceed 4000 ft. A large portion of the Pacific coast of the U.S. is formed by the w. slopes of the Coast Range. Puget Sound, San Francisco Bay, and Monterey Bay are the only major indentations on the coast. The region between the Coast Range and the Sierra Nevada-Cascade system is occupied by a succession of lowland valleys, one of the most fertile farming areas in the U.S. From n. to s., these are the valleys of Puget Sound and the Willamette, Sacramento, and San Joaquin rivers.

UNITED STATES OF AMERICA, THE



UNITED STATES OF AMERICA, THE

Rivers and Lakes. Among the major rivers of the U.S. are the Connecticut, Hudson, Delaware, Susquehanna, Potomac, James, Roanoke, and Savannah, which empty into the Atlantic Ocean; the Allegheny, Ohio, Wabash, Tennessee, Missouri, Red, Platte, Arkansas, and Yellowstone, which are part of the Mississippi R. system; the Mississippi, Mobile, Brazos, and Rio Grande, which empty into the Gulf of Mexico; and the Columbia, Sacramento, and Colorado, which empty into the Pacific Ocean. The most important lakes, in size and economic importance, are the Great Lakes (q.v.); see ERIE, LAKE; HURON, LAKE; MICHIGAN, LAKE; ONTARIO, LAKE; SUPERIOR, LAKE. These lakes, collectively the largest body of fresh water in the world, have a total area of 94,488 sq.mi., of which 60,306 sq.mi. is under the jurisdiction of the U.S. Lakes and ponds are especially numerous in Maine, New York, Minnesota, Wisconsin, New Jersey, Florida, and Oregon. The Great Salt Lake is one of the outstanding natural wonders of the U.S.

For the physiographic features of Alaska and Hawaii, see ALASKA and HAWAII: *The Land*.

Geology. The oldest rock systems in the U.S. belong to Precambrian times, dating back more than 500,000,000 years. Most Precambrian rock is buried hundreds of feet under layers of younger rock. Outcroppings are found, however, in uplifted areas throughout the country. In the E. United States, Precambrian rock most often appears on the surface in a narrow belt along the E. edge of the Appalachians from New York to Alabama. In the region around Lake Superior, the Canadian Shield, the most extensive area of exposed Precambrian rock in North America, projects down from Canada into Michigan, Minnesota, and Wisconsin. Outcroppings of Precambrian rock also appear in the Sioux uplift of Missouri, the Arbuckle and Wichita Mts. of Oklahoma, the Black Hills of South Dakota, the Front Range of the Rocky Mts. in Wyoming and Colorado, the Uinta and Wasatch mountains in Utah, and the lower strata of the Grand Canyon. Precambrian rocks are hard and crystalline, formed by igneous and metamorphic processes. Granites, gneisses, schists, marbles, and quartzites are the common kinds.

The next oldest formations belong to the Paleozoic Era, a very long interval of geological time divided into Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, and Permian periods. The rocks of the Cambrian, or earliest of these periods, are mainly sandstones, limestones, conglomerates, and shales formed from eroded rock material that settled in the beds of the shallow seas covering

much of the U.S. land area. These rocks are found in limited outcrops about the borders of the earlier crystalline rocks. Formations of the Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian periods are more widespread, especially in the E. United States. They constitute the bedrock of a region extending W. from the Appalachians to beyond the Mississippi R., where they reach into E. Nebraska, central Kansas, and far into Texas. They do not appear S. of central Georgia and Alabama, nor along the Mississippi S. of the Ohio R. Undoubtedly the best-known formations of the mid-Paleozoic Era are the coal beds of the Appalachian region, which were formed from the vegetation of swamps dating back to the Mississippian and Pennsylvanian periods. The most extensive W. lands during the Paleozoic Era were in the region now occupied by the Great Basin. The regions of the present Colorado Plateau and the coastal Pacific States were then sea, and the Rocky Mt. belt was a chain of islands.

The Paleozoic Era closed, in North America, with the upheavals that created the Appalachians. The Cambrian deposits, which had reached a thickness of several miles, were uplifted into a range of high mountains. These mountains were gradually eroded, leaving the low ranges found now in the E. United States. During the mountain-building period a general rise of elevation occurred throughout the E., which banished the seawaters from the N.E. and central States of the Mississippi Basin.

In the Mesozoic Era and the succeeding Tertiary Period, land was added to the Atlantic border and the Gulf region in the E. In the W. the interior sea of the Great Plains region gradually disappeared, and the Pacific coastline was pushed to its present position.

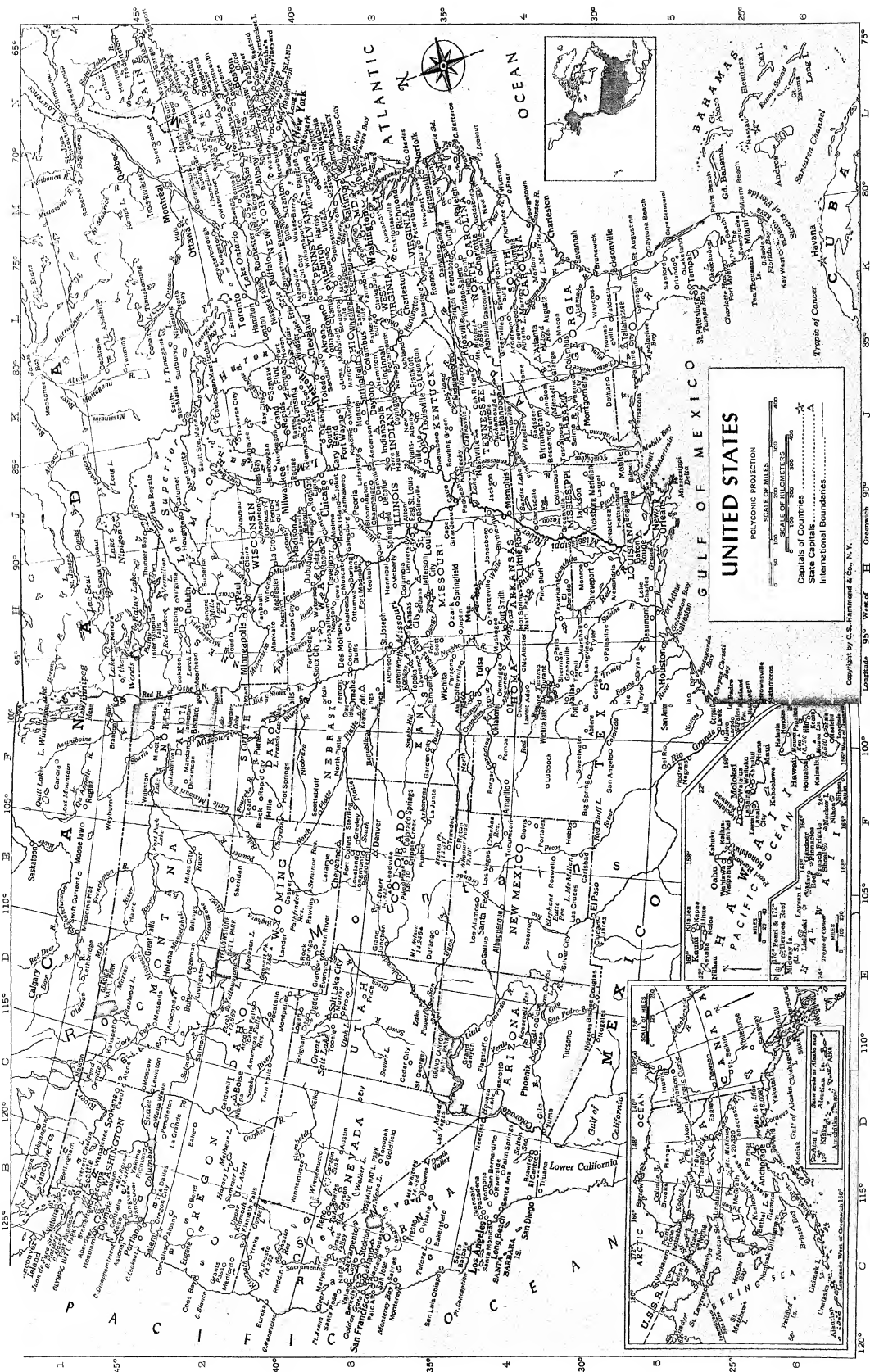
Some of the existing evidence of Mesozoic and Tertiary geological episodes may be noted. The Atlantic coastal region has several areas of red and brown shale and sandstone formed by undersea sedimentation early in the Mesozoic Era. These formations underlie the lowlands of the Connecticut R. valley in Massachusetts and Connecticut. Another belt extends from the Palisades of the Hudson R. into Virginia, and other, smaller areas exist. Associated with these sedimentary rocks are the lava sheets that form the Watchung Mts. of New Jersey, the Palisades of the Hudson, and the Mt. Holyoke Range of Massachusetts. The sediments of late Mesozoic and Tertiary seabeds form the Atlantic Coastal Plain from S. New Jersey S. to Florida. This sedimentary layer extends into the marginal waters of the Atlantic Ocean, where it reaches a thickness of

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Abilene, Tex.	G 4	Billings, Mont.	E 1	Colorado (riv.), Tex.	G 4	Faribault, Minn.	H 2
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Alabama (State)	J 4	Birmingham, Ala.	J 4	Columbia (capital), S. C.	K 4	Fear (cape), N. C.	L 4
Alabama (riv.), Ala.	J 4	Bisbee, Ariz.	E 4	Columbia (capital), Tenn.	J 3	Flagstaff, Ariz.	D 3
Alameda, Calif.	B 3	Bismarck (capital), N. Dak.	F 1	Columbia (riv.)	B 1	Flattery (cape), Wash.	A 1
Alaska (State)	A 5	Bitterroot (range)	D 1	Columbus, Ga.	K 4	Flint, Mich.	K 2
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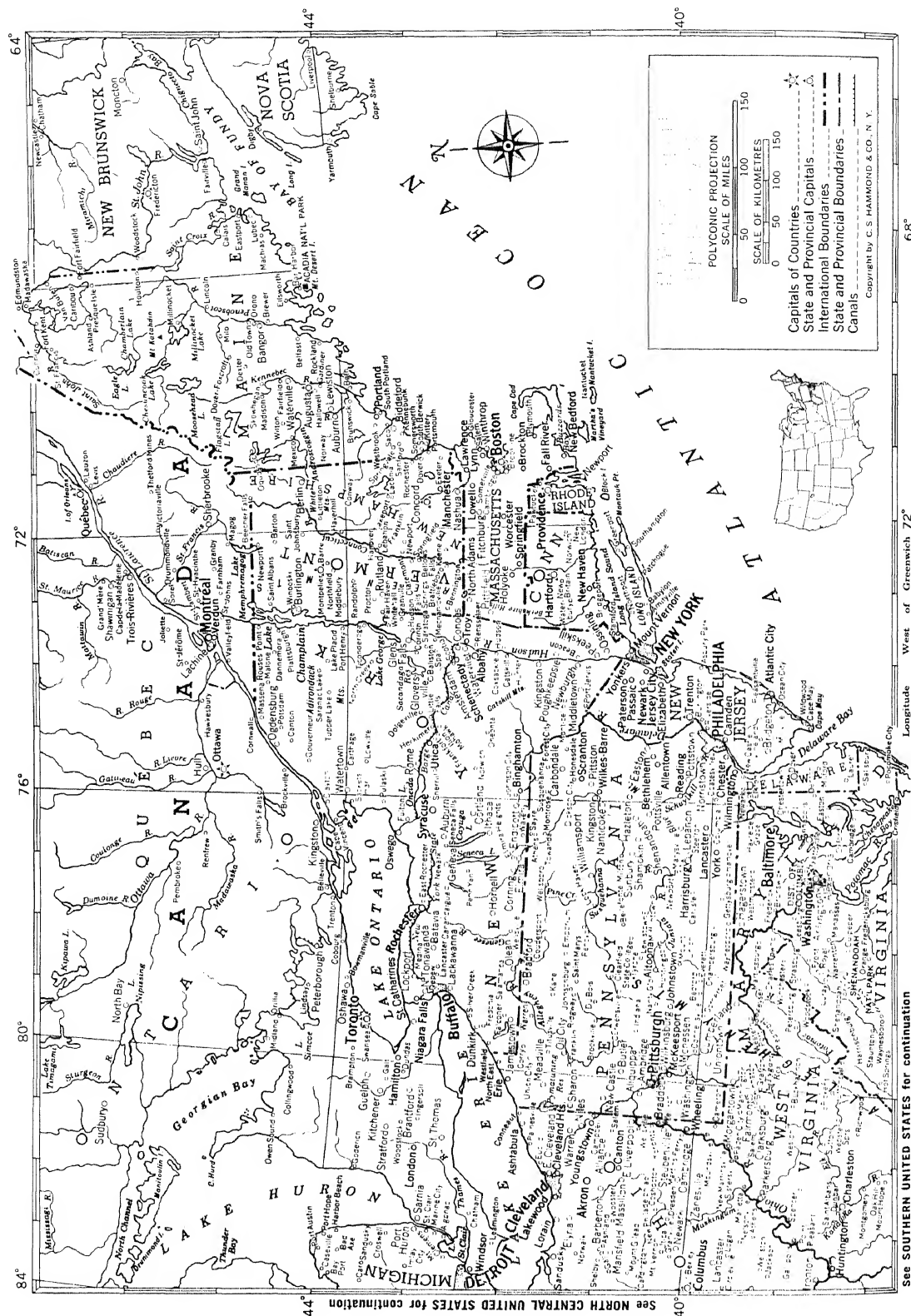
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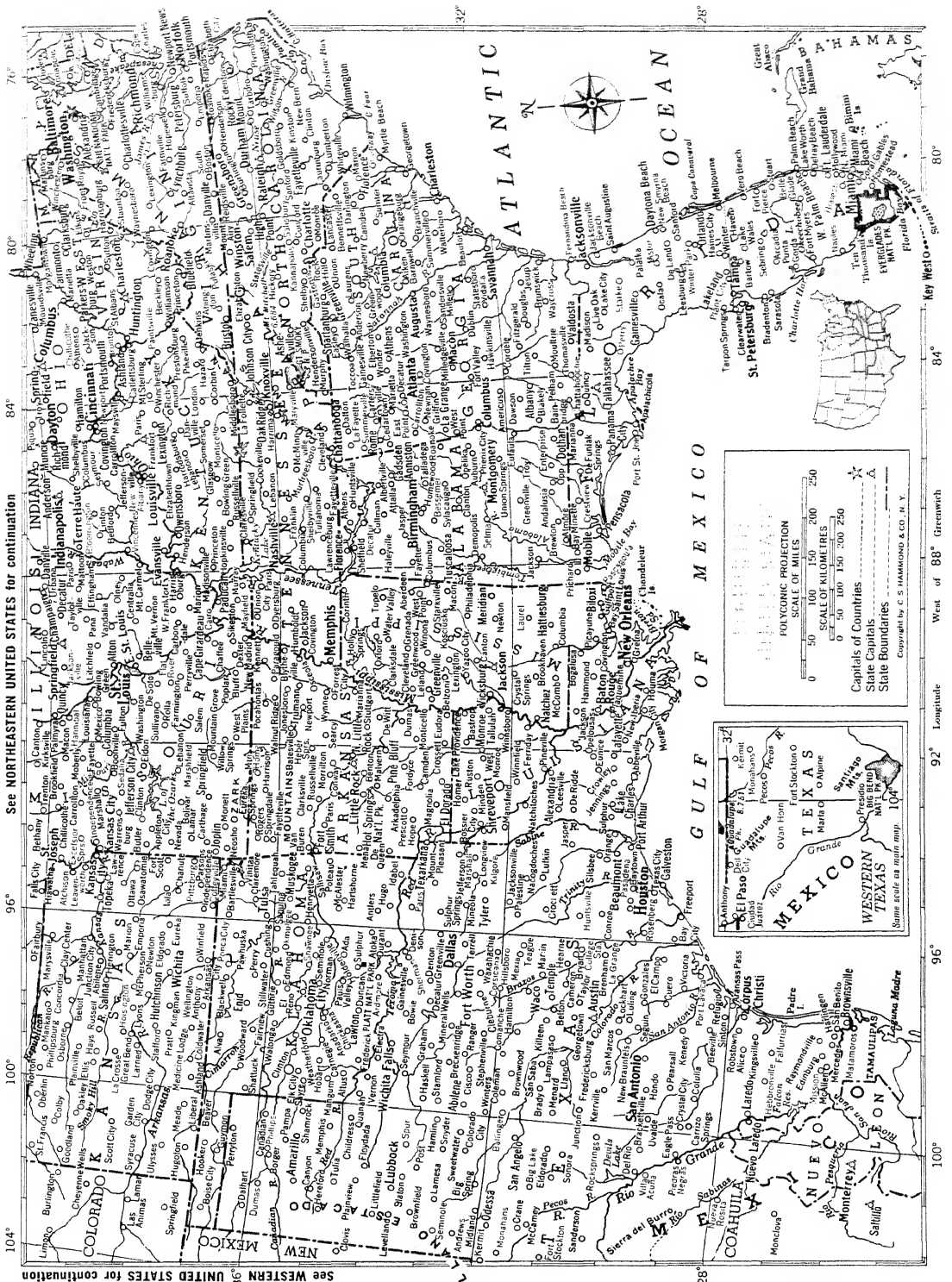
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 Trinity (riv.), Tex. G 4
 Troy, N. Y. M 2
 Tucson, Ariz. D 4
 Tucuman, N. Mex. F 3
 Tulare (lake), Calif. B 3
 Tulsa, Okla. G 3
 Tuscaloosa, Ala. J 4
 Twin Falls, Idaho C 2
 Tyler, Tex. H 4
 Unalakleet, Alaska C 5
 Unalakleet, Alaska C 6
 Unimak (isl.), Alaska C 6
 University City, Mo. H 3
 Upper Klamath (lake), Oreg. B 2
 Utah (State) D 3
 Utah (lake), Utah D 2
 Utica, N. Y. M 2
 Valdosta, Ga. K 4
 Vallejo, Calif. B 3
 Vancouver, Wash. B 1
 Verde (riv.), Ariz. D 4
 Vermilion (lake), Minn. H 1
 Vermont (State) M 2
 Vicksburg, Miss. H 4
 Victoria, Tex. G 5
 Virginia, Minn. H 1
 Virginia (State) C 3
 Visalia, Calif. C 3
 Wabash (riv.) C 3
 Waco, Tex. G 4
 Wahiawa, Hawaii F 5
 Wahpeton, N. Dak. G 1
 Waialua, Hawaii F 5
 Wailuku, Hawaii F 5
 Waipahu, Hawaii F 5
 Wales, Alaska C 5
 Walker (lake), Nev. C 3
 Walla Walla, Wash. C 1
 Washington, D. C. (cap.), U. S. L 3
 Washington (State) B 1
 Waterbury, Conn. M 2
 Waterloo, Iowa H 2
 Watertown, N. Y. L 2
 Watertown, S. Dak. G 1
 Waterville, Maine N 2
 Wausau, Wis. L 1
 Waycross, Ga. K 4
 Wenatchee, Wash. B 1
 West Palm Beach, Fla. K 5
 West Virginia (State) K 3
 Wheeler (lake), Ala. J 4
 Wheeler (peak), N. Mex. F 3
 Wheeling, W. Va. K 2
 White (riv.), Ark. H 3
 Whitney (mt.), Calif. G 3
 Wichita, Kans. G 3
 Wichita Falls, Tex. G 4
 Wilkes-Barre, Pa. L 2
 Williamsport, Pa. L 2
 Williston, N. Dak. F 1
 Wilmington, Del. L 3
 Wilmington, N. C. L 4
 Wilson (mt.), Colo. F 3
 Winnemucca, Nev. C 2
 Winnemucca (lake), Nev. C 2
 Winona, Minn. H 2
 Winston-Salem, N. C. K 3
 Wisconsin (State) H 2
 Wisconsin (riv.), Wis. H 2
 Woods (lake), Minn. G 1
 Worcester, Mass. M 2
 Wyoming (State) E 2
 Yakima, Wash. B 1
 Yakutat, Alaska D 6
 Yankton, S. Dak. G 2
 Yazoo (riv.), Miss. H 4
 Yellowstone (riv.) E 1
 Yellowstone (lake), Wyo. D 2
 Yellowstone National Park E 2
 York, Pa. L 3
 Yosemite National Park, Calif. C 3
 Youngstown, Ohio K 2
 Yreka, Calif. B 2
 Yukon (river), Alaska C 5
 Yuma, Ariz. D 4
 Zanesville, Ohio K 3

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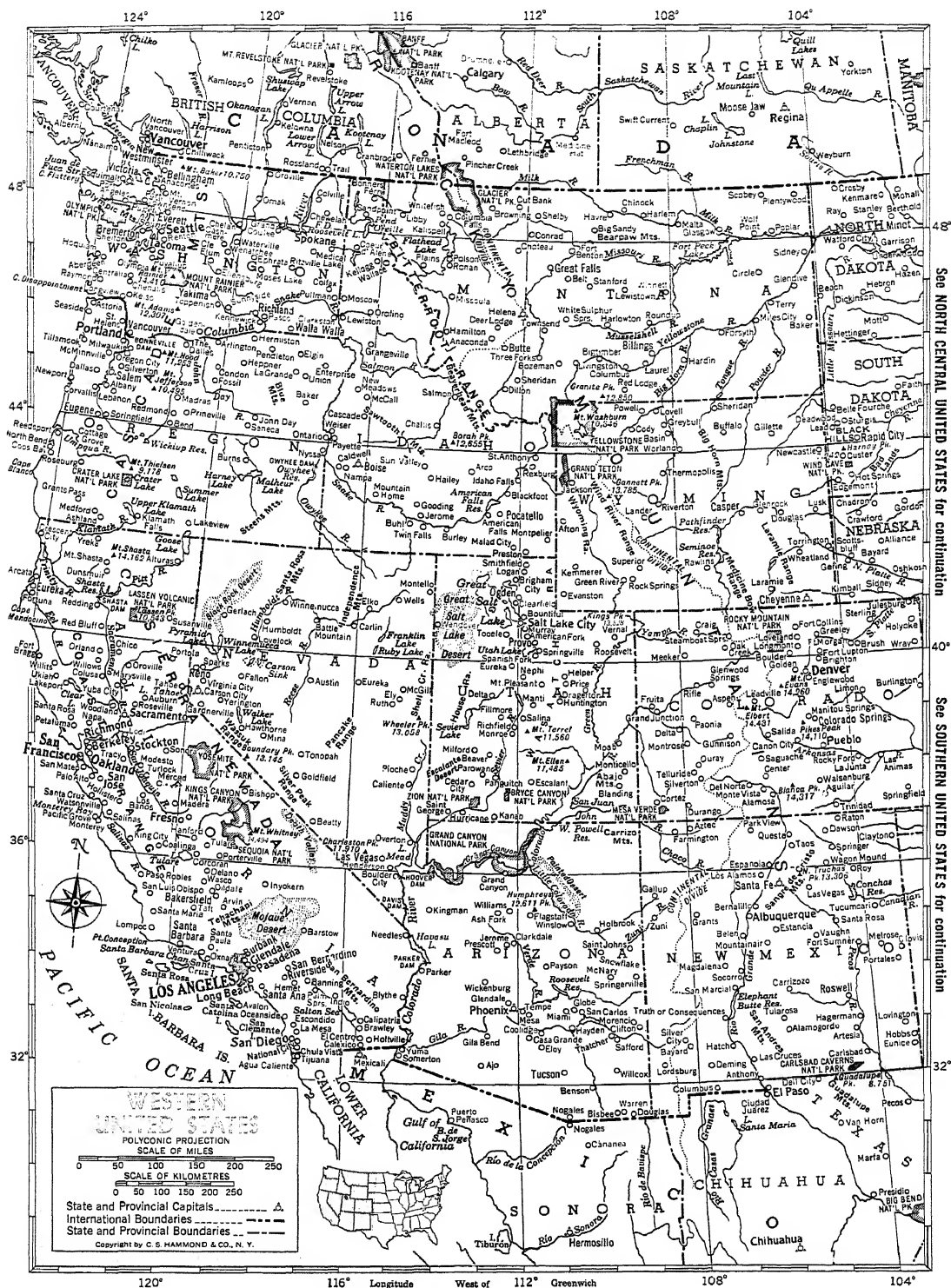


See SOUTHERN UNITED STATES for continuation





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15,000 ft. in certain areas at the edge of the continental shelf. Comparatively recent, the sediments are often unconsolidated and occur as sands, gravels, clays, and marls. But they may consist also of well-indurated (compact and hardened) sandstones and limestones.

Late Mesozoic and Tertiary sediments also form the lands that border the Gulf of Mexico, where they reach a depth of 40,000 ft. in places. From early Tertiary time, the Mississippi R. (or, more accurately, its forerunners) discharged into a gulf that covered about the same area now occupied by the lowlands of the lower Mississippi R. These ancient waters carried land waste that gradually filled the ancient gulf forming what is known as the Mississippi Embayment, a lowland region of sediments that constitutes an inland extension of the Gulf Coastal Plain.

Deposits formed in the seas that covered much of the w. United States throughout the Mesozoic Era are found along the e. base of the Rocky Mts., where they are upturned at various angles, as in the highly inclined strata of the Garden of the Gods. In the Great Plains region e. of the mountains, the deposits of Mesozoic seas lie horizontally and are often covered with younger stratified formations. Immediately e. of the mountains the deposits have yielded a remarkable series of fossil vertebrate remains.

The close of the Mesozoic Era was marked by the mountain-building revolution that created the Rocky Mts. The Great Plains seas disappeared, but the area was characterized by swamps and great lakes of brackish or fresh water. The Laramie formation, a coal-bearing layer that overlies the late Mesozoic deposits in the e. ranges of the Rockies and a bordering region of the Great Plains, belongs to this era, when coal deposits accumulated in low-lying marshes.

Over many thousands of square miles in Colorado, Kansas, Wyoming, and Nebraska are sheets of partly consolidated gravels, sands, and clays. These sheets have usually been attributed to sedimentation in the ancient lakes left after the retreat of the inland seas. It is probable, however, that at least part of the deposits were washed down from the mountains. Present geological conditions were not approached in this region until the late Tertiary Period. By that time the Great Plains region and the Rocky Mts. had undergone a massive uplift, which drained the lakes and gave the plains a downward slant from w. to e.

The rocks of the Colorado Plateau consist of beds of sediment thousands of feet thick, which

were deposited in Mesozoic and later times over a Paleozoic and Precambrian foundation. The geological history of this region is dramatically exposed in the Grand Canyon and other places at which the Colorado R. has sunk its channel through the Paleozoic strata and cut far down into the basal granites. Like the Great Plains, the Colorado Plateau was long a region of marine deposition; here too, great uplifts took place, producing fractures and dislocations or faults. At times the uplifting process was attended by large upflows of lava, some of which stopped below the surface and domed up the overlying strata, making a kind of mountain known as laccolithic. The Henry Mts. in Utah are typical of such formations.

The initial uplifts of the Sierra Nevada-Cascade mountain belt were made in Mesozoic time, and the strata involved were formed from the waste of the older lands in the present Great Basin region to the e. Late in the Tertiary Period the entire mass of the Sierras was lifted to a great height and tilted to the w.

Thus it appears that the land of the w. United States began with island nuclei, which grew by sedimentation and uplift. The great mountain ranges developed during several periods of folding, faulting, and uplift; and massive upheavals, continental in scale, added to the height of the mountains and converted the plains into plateaus of from 3000 to 8000 ft. in altitude. Accompanying these disturbances, especially in Tertiary times, were the most extensive outflows of lava known to have occurred on the North American continent. Evidence of this volcanism is found in nearly every Cordilleran State. It occurs on both sides of the Rocky Mts. in Colorado, in New Mexico, in Utah, and especially in the lava plateaus of the Snake and Columbia rivers in Idaho, Washington, and Oregon. Representing a lingering episode of volcanic energy are the geyser phenomena of the Yellowstone National Park.

Through all the periods that have been reviewed, the process of land sculpture was continued. Successive cycles of denudation and uplift sometimes have produced all varieties of relief in a single area. Thus New England retains many mountainous structures, although the once sharp outlines of its mountains have been reduced and smoothed.

The strata of the Mississippi basin have for the most part never been raised much, and the streams have not had sufficient vigor to be the instruments of large-scale denudation. But among the mountains and plateaus of the Cordilleran region the land forms owe their reliefs

Text continued on page 45

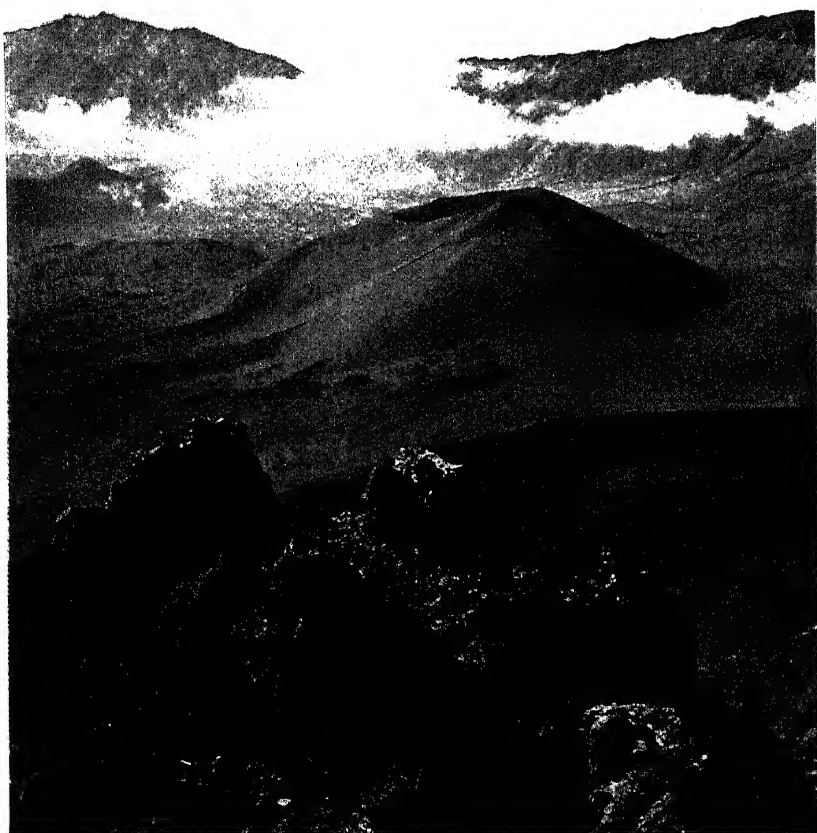


United States. Plate 1. Politically but fifty states, America geographically blends thousands of exciting landscapes. Along the nation's western boundary, the Pacific Ocean thunders against jagged coastlines. David Muench - Alpha



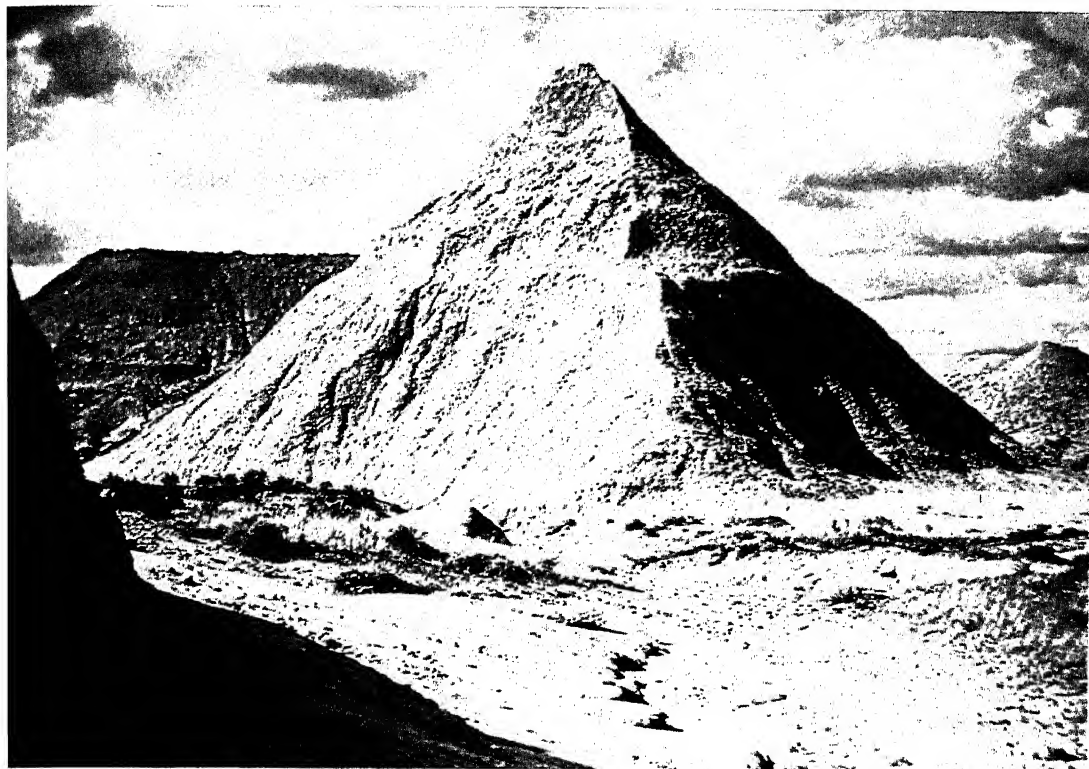
Much of the topography of the nation's northernmost State, Alaska, has resulted from the region's extreme climatic conditions. In high latitudes where snow falls at a rate greater than it melts, glaciers form. The Portage Glacier (above), upon reaching water, spawned large masses of floating ice. Bob and Ira Spring - FPG

U.S. Plate 2.



Some 2400 mi. across the Pacific Ocean lies the nation's newest State, Hawaii. All of the larger islands in the archipelago are of volcanic origin. Haleakala Crater (left) on Maui is the biggest inactive crater in the world. The Haleakala basin has a depth of some 2000 feet and a circumference extending about 20 mi.

David Muench - Alpha



Nebraska Game and Parks Commission

U.S. Plate 3. Above: Barren semiarid land extends some 2000 sq.mi. in southwestern South Dakota and northwestern Nebraska. Known as Badlands, such regions are made up of fantastically shaped rock masses and steep hills almost bare of vegetation. Below: Through the southern States occur low-lying pockets of swampland. The spongy soil is typically saturated with water and covered densely with trees and shrubs.



South Carolina Dept. of Parks, Recreation and Tourism



FPG

U.S. Plate 4. Above: In New England, the collective name for the six northeastern States, autumnal foliage again enfolds a rural village. Below: The northwestern States escalate their productivity by harnessing water resources. The Columbia River, pictured, in addition to its navigational importance, is one of the major sources of hydroelectric power and irrigation in the U.S.

Oregon State Highway Dept.





U.S. Plate 5. In metropolitan areas, steel, concrete, and glass spectacularly replace natural scenery. New York City is the nation's largest city in population.

Burt Glinn - Magnum



Harvey Stein



Roger Malloch - Magnum

***U.S. Plate 6.** Man-made skylines: Luxury hotels (top) at the popular resort island of Miami Beach, Fla.; skyscrapers (center) in Chicago, Ill., commercial center of the Midwest; and office buildings (bottom) in San Francisco, Calif., leading west coast city.*



M. A. Yuschenkoff - Black Star

to long-continued denudation working on rocks of varying composition and structure.

The principal reliefs were formed prior to the glacial invasion, but within the glaciated areas important changes were effected. In some cases glacial movements wore down mountains and filled in valleys to such an extent that the relief was diminished by several hundred feet. The territory affected by glaciation includes all of New England, the Middle Atlantic States into N. New Jersey and Pennsylvania, the Great Lakes region, and the territory between the Ohio and Missouri rivers. Ice sheets also covered much of the N. part of the Cordilleran region, and remnant glaciers are still found in the high Sierras, on the volcanic cones of the Cascades, and in Montana and Colorado. The general effects of the glaciation were the grinding and transport of rocky waste, coarse and fine, the blending of this material with the preexistent soils, the development of moraines and other formations of drift during retreat, the blockading of ancient valleys, causing innumerable changes of drainage, and the creation of thousands of lakes.

Since the departure of the ice, many of the smaller or more shallow lakes have been filled by sediment, including deposits of vegetable origin that formed beds of peat. Some of the larger lakes became deltas and marshy areas as sediments gradually accumulated. Streams interrupted by the ice sheets have resumed their flow and in so doing have often cut through the veneer of drift and worn deeply into the underlying rock. Stream erosion is the origin of most of the gorges of the N. States. These gorges are young postglacial valleys, and the old, buried channels are often to be found not far away. The rocky masses and spurs encountered by the streams have caused rapids or falls, thus creating valuable sources of power.

See also GEOLOGY; GEOLOGY, ECONOMIC; GEOLOGY, HISTORICAL; and separate articles on individual geological periods.

Climate. Wide regional and seasonal variations of temperature are encountered within the U.S. mainland. Average annual temperatures range from about 40° F. along the N. frontier to about 75° F. in the S.E., where subtropical conditions prevail. During July, usually the hottest month in the U.S., temperatures average about 65° F. in some of the N. regions. In January, the coldest month, the average temperature in the coldest parts of the N. is about 10° F. Corresponding average temperatures for July and January in the S. part of the country are about 90° F. and 67° F. The highest temperature in U.S. official records was 134° F., reported in Death Val-

ley, California, in 1913; the record low (outside of Alaska) was -70° F., reported in Montana in 1954. The greatest annual ranges in temperature occur in the N. interior; North Dakota reported the widest difference, 181°, in 1936. One of the most equable climates in the country is that of San Francisco, where the annual range between high and low temperatures is only about 24°. The period between the first autumnal and last vernal frosts is about 270 days in parts of the N.W., whereas in parts of the S., years may pass without a single killing frost.

This variability of temperature is one of the distinctive features of the U.S. environment. It is attributable to a peculiar set of meteorological and physiographical circumstances that are discussed below.

CLIMATIC INFLUENCES. Weather conditions characterizing the U.S. are influenced by at least six separate air masses, which move into the country from various directions. Two of these air masses originate over the Pacific: Pacific polar maritime air, as meteorologists call it, moves in from the North Pacific in all seasons of the year, bringing cool temperatures, showers, and good visibility to the West Coast; Pacific tropical maritime air reaches the West Coast from the Central Pacific in winter, bringing warmth, moisture, and cloudy skies. Two other air masses originate over land to the N. and S. of the U.S.: Polar continental air moves in from the N. over Canada, bringing lower temperatures and lower humidity in all seasons; tropical continental air advances into U.S. skies in summer from over the dry plateaus of Mexico, bringing hot, dry air and cloudless skies. A third pair of air masses originate in the Atlantic: Atlantic polar maritime air usually does not reach the U.S. mainland, but when it does, it brings cloudy, raw weather in winter and damp, cool weather in summer; Atlantic tropical maritime air moves in from the Central Atlantic-Caribbean area, bringing higher temperatures and humidity. These air masses, interacting with each other and with other factors, including seasonal temperature trends and such physiographic features as lakes, mountains, and deserts, determine the weather conditions prevailing in a region at any particular time.

One of the physiographic characteristics of North America that has profoundly influenced the U.S. climate is the N.-S. orientation of the major mountain systems. Because of this orientation, the high mountain ranges of the Cordilleran region act as barriers to prevent moisture-laden Pacific air from reaching the interior of the country. At the same time, the absence of

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E.-W. mountain ranges leaves the Interior Plains region with no defense to block the advance of polar air moving down from the N. or tropical air moving up from Mexico and the Gulf of Mexico. This N.-S. flow of heat and cold, combined with a general westerly drift to the movement of air in the global belt in which the U.S. lies, has the effect of producing continental types of climates from the Rocky Mts. eastward to the Atlantic Ocean. Continental climates, which are created by the effects of land surfaces rather than oceans, are characterized by wide ranges in temperature, sudden changes in weather, and moderate to light rainfall.

The W.-E. drift of air masses generally keeps Atlantic air masses offshore and minimizes their effects on the climates of the New England and Central Atlantic regions. In these regions and around the Great Lakes, the climates are of a modified continental type. Winters are long and cold, summers range from warm to cool, and rainfall is moderate, averaging between 30 and 50 in. a year. Westward into the Interior Plains, temperature variations become more extreme, and rainfall dwindles gradually to 15 in. or less near the Rocky Mts. A weather phenomenon that is particularly identified with the Interior Plains region is the tornado (q.v.), an extremely destructive windstorm caused by the interaction of cold and warm air masses.

Along the South Atlantic and Gulf coasts the climate, influenced by tropical maritime air, is somewhat less prone to continental extremes. Winters are mild, although occasional spells of cold weather occur; summer temperatures range from subtropical to warm temperate; and precipitation is generally higher than in regions to the N. This part of the country is often assailed by hurricanes, circular winds similar to the tornado in form but much larger in scope and duration.

In spite of the extent of the U.S. coastline on the Atlantic Ocean and the Gulf of Mexico, the only part of the country with a climate that is truly maritime is along the Pacific coast. As shown by the accompanying table of average temperature readings taken on the Atlantic and Pacific coasts at sea level, the annual range of

temperature on the Pacific coast is much smaller than on the Atlantic. The N. part of the Pacific coast has cool summers, mild winters, and the heaviest rainfall in the U.S. Precipitation, mainly confined to the winter season, amounts to more than 100 in. annually in the coastal areas of Oregon and Washington. Farther S., the climate resembles that prevailing on the shores of the Mediterranean Sea. Winters are short, cool, and damp, and summers are long, hot, and dry. The Sierra Nevada and Cascade mountain ranges on the West Coast and the Rocky Mts. farther inland intercept the moist winds blowing in from the Pacific, and their slopes are well watered. The intermountain region of plateaus and basins constitutes, however, the most arid part of the U.S. Rainfall in the S. part of the intermountain region averages less than 10 in. a year in some sections, and summer temperatures rise higher than in any other part of the U.S. In the N. part of the intermountain region precipitation is somewhat higher than in the S. part but is generally less than 20 in., and winter temperatures fall to record lows for the U.S. in some of the high mountain valleys.

OUTLYING STATES. The climate of the W. and S. coasts of Alaska is modified by maritime air masses from the Pacific Ocean in all seasons. The interior of the State, deprived of this moderating influence, experiences long and extremely cold winters.

Hawaii is a land of eternal summer. Precipitation on the islands varies considerably between the windward side, where rainfall is extremely heavy, and the leeward side, where semiarid conditions prevail.

See also WEATHER SERVICE, NATIONAL.

Natural Resources. In the general abundance and variety of its natural resources, the U.S. is one of the best endowed countries of the world. The indigenous wealth of the land was a determining factor in all stages of national development. The virgin forests, the availability of fertile land, the plenitude of furbearing animals and of fish attracted colonial settlers and virtually assured the economic success of their colonies. At a later period the vast tracts of arable

LATITUDE NORTH	JANUARY			JULY		
	Atlantic Coast	Pacific Coast	A-P	Atlantic Coast	Pacific Coast	A-P
48°	14° F.	39° F.	-25° F.	63° F.	55° F.	+ 8° F.
46	18	39	-21	63	60	+ 3
44	20	40	-20	65	65	+ 0
42	30	44	-14	70	65	+ 5
40	32	45	-13	73	60	+13
38	40	49	- 9	75	65	+10
36	45	50	- 5	77	65	+12
34	47	50	- 3	80	65	+15
32	50	50	- 0	82	70	+12

land in the Interior Plains and the lure of gold, silver, and other minerals in the West encouraged territorial expansion across the continent. Its great mineral wealth was a major factor in establishing the industrial preeminence of the U.S. in the world after the Civil War.

MINERALS. The U.S. has an abundance of certain key minerals, namely, iron, petroleum, and coal, which provided the basic material and fuel to build and operate the machines of an industrial civilization. Coal has been extracted and used in the U.S. since the 18th century. Coal reserves, mainly bituminous but including large deposits of anthracite, are now estimated at about 2,000,000,000,000 tons. Of these reserves, the most productive fields are situated in the Appalachian system, where both anthracite and bituminous coal are mined. Major bituminous coalfields are situated also in the Interior Plains and Cordilleran regions, as well as in Alaska, and considerable subbituminous coal and lignite are found in various areas.

Petroleum was first extracted in the U.S. in 1859, but it did not begin to assume its present importance until after 1900. During the past half century the volume of oil taken from U.S. wells has increased by more than 700 percent; annual production amounted to about 443,000,000 bbl. in 1920; in 1940 it totaled 1,353,000,000 bbl., and in the early 1970's about 3,500,000,000 bbl. annually. Texas, Louisiana, California, Oklahoma, Wyoming, and Kansas possess the most productive oil wells and the richest known oil reserves in the U.S. mainland, as well as large deposits of natural gasoline and gas. Proved oil reserves were estimated at 38,000,000,000 bbl. in 1971, including the vast oil fields in Alaska discovered in 1968.

Iron was mined and smelted on a small scale in colonial days, and the growth of the iron and steel industry was a fundamental development in the U.S. industrial revolution. The chief source of high-grade iron ore in the U.S. is the highland region adjoining Lake Superior, where the Marquette iron range was opened in 1848, and the Mesabi range (q.v.), the most productive of all, in 1892. Other important deposits of good-quality iron ores are scattered throughout the country, particularly in the Appalachian and Cordilleran regions.

Besides iron, many of the other industrially important metals are relatively plentiful in the U.S. The country accounts for an important share of world production of copper, lead, zinc, aluminum, cadmium, titanium, magnesium, molybdenum, tungsten, and vanadium, and lesser shares of such metals as gold, silver, bauxite, se-

lenium, tellurium, platinum, mercury, and uranium. Excessive exploitation has seriously depleted the reserves of even the more abundant metals, however, and the U.S. now relies on imports to supplement domestic production of many important industrial metals.

In addition to fossil fuels, the U.S. is a major world producer of such important nonmetallic minerals as barite, cement, diatomite, feldspar, gypsum, mica, sulfur, and fertilizers, including nitrogen, phosphate, and potash. The country also possesses huge reserves of rock salt, granite, marble, slate, limestone, sand and gravel, fuller's earth, and other clays.

Despite the abundance and diversity of its natural mineral wealth, the U.S. lacks several minerals of industrial importance and must depend almost entirely on foreign sources of supply. These include tin, manganese, nickel, chromium, asbestos, and industrial diamonds.

PLANTS. The range of latitude and the variety in topography and climate have produced great diversity in the indigenous plant life of the country. The forest vegetation includes more than a thousand varieties of trees, comprising softwood evergreen conifers, broadleaf evergreens, and hardwood deciduous trees. They range from trees adapted to survive the rigors of high-altitude or subarctic regions to those requiring tropical or semitropical climates. At the time when European settlement began, almost half the area of the U.S. mainland was covered by forests, of which about 80 percent were concentrated in the e. half of the country and the remainder were distributed in the Cordilleran zone.

In the e. United States virgin forests once extended w. from the Atlantic coast to Wisconsin and Minnesota in the n. and into e. Oklahoma and Texas in the s. Of these original woodlands, only about 10 percent remain. Most of the deciduous forests are found in the e. zone, which also contains both dense stands and scattered growths of conifers. Coniferous trees, including spruce, balsam, fir, cedar, and tamarack, predominate throughout the interior of Maine, on the higher Appalachian slopes, particularly in New York, and in the same latitudes around the Great Lakes. Forests of white pine, jack pine, red pine, and hemlock occur in all the New England States, in an extensive area to the s.w. of New England, and in large tracts in the n.e. of the Interior Plains. These areas also support stands of deciduous trees, chiefly maple, birch, elm, beech, and oak. Several coniferous species, especially the longleaf, loblolly, and slash pines, are the predominant trees on the broad coastal

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plain extending from the vicinity of Cape Hatteras to the Mississippi delta. Scattered stands of pine are found throughout the remainder of the e. forest zone, but deciduous types are much more prevalent. Among the most widespread varieties are the white oak, sugar maple, shagbark hickory, trembling aspen, American elm, beech, birch, white ash, tulip tree, sycamore, basswood, black walnut, black locust, black willow, sassafras, and hornbeam. Some of the trees distinctive to the s. part of this forest zone are the pecan, southern magnolia, and American holly, as well as the red gum, black gum (tulipelo), and cypress. These trees are especially numerous in the Mississippi Embayment, reaching inland from the Mississippi delta to the mouth of the Ohio R. A number of subtropical and tropical trees flourish in s. Florida. These trees include the banana, mangrove, coconut palm, royal palm, and manchineel.

Between the e. forest zone and the mountainous Cordilleran region lies a vast area of natural grassland, which is now almost totally transformed into farmland. The only trees occurring naturally in this zone are found along the river banks, where moisture is adequate to support their growth. The trees are the same varieties found in the deciduous forests w. of the Appalachians.

In the forests of the Cordilleran region coniferous trees predominate. The most extensive and impressive Cordilleran forests are along the Pacific coast on the slopes of the Sierra Nevada-Cascade and Coast Range mountain systems. The most common conifers found in this area are the Douglas fir, the western red cedar, the western and mountain hemlocks, the western white ponderosa, lodgepole, and sugar pines, and two species of the sequoia. The older sequoia trees have been growing for almost 4000 years. They are believed to be the oldest plants on earth except for a stand of bristlecone pines in California, which are estimated to date back 4500 years. Several other unusual trees are the Port Orford cedar and the Monterey cypress, which are conifers, and the madrona and the California laurel (also called Oregon myrtle), both of which are broadleaf evergreens. Among the most familiar deciduous trees are the bigleaf maple, Oregon white oak, Oregon ash, willow, and black cottonwood. In the more arid sections of California are extensive growths of scrub oak called chaparral. Away from the Pacific coast, Cordilleran forests are scattered throughout the Rocky Mts. in Montana, Wyoming, Colorado, Utah, and New Mexico. The trees, which are generally smaller than on the

Pacific coast, include spruce, fir, and most of the species common to the n.w. United States. Deciduous trees in the Rockies are confined mainly to the banks of streams. The ponderosa pine and piñon, both adapted to a dry climate, flourish on the Colorado Plateau. Trees of the s.w. desert regions include mesquite, saguaro, or giant cactus, palo verde, and Joshua tree.

Alaska has extensive coniferous forests in the Panhandle and in the s. part of the main peninsula. The Panhandle forests, in particular, are quite similar to those in Washington and Oregon. The predominant species there and in the main peninsula is spruce, but hemlock and cedar are also found. Northern Alaska, where the ground remains perpetually frozen a few feet down, is a grassy tundra (q.v.).

In the early 1970's forests covered approximately 753,500,000 acres, or about one third of the total land area of the U.S. About 500,000,000 acres of these forests were classified as commercial, that is, suitable for wood production. More than 25 percent of the commercial forest land was owned by Federal, State, and local governments, which maintained the forests chiefly as timber reserves, for recreational purposes, or for protection of watersheds.

The States with the more extensive forest lands are Alaska, with about 119,000,000 acres of forests, California, with 42,500,000 acres, and Oregon, with 30,000,000 acres.

The indigenous flora of the U.S. includes more than 12,000 species of smaller plant life. Rosette herbs, dwarfed shrubs, and other varieties of arctic-alpine vegetation grow above the timberline in the mountain ranges. Berry-bearing plants, the catawba rhododendron and other evergreen shrubs, and numerous species of herbs are widespread throughout the e. forest zone. Representative small flora of the Sierra Nevada-Cascade belt are ferns, mosses, and such shrubs as thimbleberry, salmonberry, and salal. Sagebrush, greasewood, juniper, shad scale, and other low shrubs are common in the Colorado Plateau area and in the Great Basin region. Vegetation in the hot desert areas of the s.w. consists largely of spiny plants with reduced or thickened foliage, notably cacti of many species, yucca, ocotillo, acacia, and the creosote bush. Grasses flourish in some areas of the arid zone, mainly at higher altitudes. See CONSERVATION; DESERT; FOREST; PLANTS, GEOGRAPHIC DISTRIBUTION OF. For information on the vegetation of Hawaii, see HAWAII: *Plants and Animals*.

ANIMALS. Practically all the species of North American animals are represented within the U.S.; see NORTH AMERICA: *Natural Resources*.

One of the most distinctive American animals is the bison, which once roamed in vast herds over the Interior Plains. Killed by the thousands for food and sport, bison now exist only in captivity or in protected areas. Beaver pelts were a major source of wealth in colonial times, but the beaver is another American animal that was almost hunted out of existence. Moose and woodland caribou, found in N. regions of the U.S., the Kodiak and the brown bear of Alaska, and the grizzly bear, found in the Cordilleran region, are the largest quadrupeds indigenous to the country. The Cordilleran region is the home of several species of bear and of the pronghorn, Rocky Mountain sheep, Rocky Mountain goat, cougar, coyote, timber wolf, antelope, jackrabbit, raccoon, prairie dog, gopher, and squirrel. Quadrupeds native to the arid s.w. are the jaguar, which is very rare, the desert fox, ocelot, armadillo, and kangaroo rat.

Besides the moose, caribou, and other species of deer, the bear, timber wolf, and a wide variety of smaller quadrupeds inhabit the E. forest zone of the U.S. The lynx, fox, marten, skunk, weasel, mink, otter, muskrat, porcupine, opossum, raccoon, hare, woodchuck, chipmunk, and squirrel are fairly widespread, and species of rat and mouse are numerous. In Hawaii the only indigenous mammal is the bat.

The bird life of the U.S. mainland includes many game birds, most notably various species of duck, goose, and grouse, the wild turkey, the quail, and the plover. Gulls are numerous in the coastal areas. Other varieties of waterfowl are the crane, heron, swan, loon, kingfisher, cormorant, egret, bittern, flamingo, and pelican. Among predatory birds are several species of eagle, the California condor, the turkey buzzard, and various species of owl and hawk. Representative smaller birds include the robin, bobwhite, bluebird, catbird, blackbird, crow, oriole, thrasher, bobolink, thrush, woodpecker, pigeon, hermit, mockingbird, hummingbird, swallow-tailed kite, cardinal, meadowlark, song sparrow, house sparrow, and starling.

Many species of poisonous snakes are found among the reptiles of the U.S. The rattlesnake family is widely distributed, particularly in the wooded and mountainous areas. Other venomous varieties include the coral snake, copperhead, and water moccasin. Harmless snakes are also common. The crocodile is found in s.e. Florida, and the alligator inhabits this region and other areas along the s. and Gulf coastal plains. Reptiles of the desert regions of the s.w. are the Gila monster, a venomous lizard, and the horned toad, a harmless lizard. Many different

varieties of reptiles also are found in Hawaii.

The lakes and streams of the U.S. support such edible varieties of fish as salmon, trout, catfish, black bass, sturgeon, muskellunge, and carp. The coastal waters contain such shellfish and fish as oysters, shrimp, crabs, flounder, cod, mackerel, menhaden, pilchard (sardine), haddock, herring, tuna, and rosefish. Alaskan waters are the habitat of a number of large marine animals, including the fur seal of the Pribilof Islands. See ANIMALS, GEOGRAPHIC DISTRIBUTION OF. For information on animal life in Hawaii, see HAWAII: *Plants and Animals*.

SOILS AND FARMLAND. Soil is a mixture of inorganic and vegetable matter and varies according to such influences as geological factors, terrain, elevation, climate, and vegetation. The U.S. has many thousands of types of soil, but, for purposes of simplicity, they are discussed here according to a few important characteristics.

Most of the soils in the E. half of the U.S. mainland and along the N.W. coast developed in naturally forested regions having a relatively humid climate. Soils formed under such conditions generally are acid and tend to be lacking in soluble mineral salts because of the leaching action of water. Many areas having forest-developed soils are ill suited for cultivation and are better utilized for forestry, pasturage, and non-farm uses. Good cropland exists in some of these areas, however, particularly where the soils have developed under the vegetation of deciduous forests. The soils of deciduous forests, which are gray-brown in color, are generally richer than the gray, red, and yellow soils found where the natural forests were of coniferous evergreens. In the E. part of the country the gray-brown soils occur in a region extending from s. New England s. to N. Virginia and w. around the lower part of Lake Michigan. On the West Coast they occur in parts of Washington, Oregon, Idaho, and N. California. Some of the most productive farmlands of gray-brown soils are in the Willamette R. valley of Washington and Oregon, the area around Lake Michigan, and a belt of land extending from N.E. Virginia through Maryland, Delaware, and New Jersey. The farms of these areas tend to specialize in the production of truck vegetables, fruit, dairy products, eggs, and poultry to supply the vast urbanized areas nearby. Other forest-developed soils are the gray-hued podzols found in N. New England, in the upper reaches of the Great Lakes, and in some higher parts of the Appalachians. Podzols are better suited for woodlands and pasturage than for cropland; with heavy use of fertilizers, however, farms in Maine

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produce large potato crops on such soil. Red and yellow types of forest soils cover most of the s.e. to e. parts of Oklahoma and Texas and occur in scattered patches in the mountain ranges of the West Coast. In the s.e. they are used extensively to grow cotton, tobacco, and other cash crops. The best soils of this type are in the Nashville basin of Tennessee and the bluegrass region of Kentucky and are derived from limestone.

Some of the best soils and general farming conditions in the entire country are found in the e. part of the Interior Plains in a strip of land extending from s. Minnesota through Iowa and parts of Illinois, Missouri, Kansas, Oklahoma, and Texas. In this region of prairie soils the rainfall has been sufficient to support a lush growth of tall, deep-rooted grasses, yet not so heavy as to cause excessive depletion of mineral salts from the ground. The resulting soils, which are neither acid nor alkaline to any marked degree, are unusually rich and deep. They are exceptionally productive, particularly when used for crops of the grass family such as corn, oats, sorghum, barley, and wheat. Outside the Interior Plains soils of this type are found in scattered patches in Oregon and California.

Throughout most of the Interior Plains the rainfall is lighter than in the prairie soils region, resulting in thinner stands of grass and further reduction of soil leaching. The soils are alkaline with a high concentration of mineral salts. They range in color from black or dark brown in areas of comparatively high rainfall where thick stands of grass have enriched the soil, to light brown in the semiarid lands of the w. part of the Interior Plains, where the grass was thinner. These alkaline grassland soils generally make good cropland, but lack of water is a problem. In the drier regions, therefore, irrigation is necessary to produce high yields. Wheat, and to the s., cotton, winter vegetables, and citrus fruits are among the main crops grown in the regions where these soils prevail. The mountains and deserts of the w. interior are generally less favorable for agriculture than other regions, and only limited farming is practiced between the Interior Plains and the arable plains and valleys of the West Coast.

Wholly different types of soil from the varieties described above are the alluvial soils characteristic of the lower Mississippi basin, the Great Valley of central California, and elsewhere in river valleys and other lowland areas that are subjected to periodic flooding. Alluvial soils, which consist of deposits of silt carried by water from other areas, are too recently settled to be

influenced by such local factors as leaching and vegetation. They usually make excellent cropland if properly drained; in the Mississippi basin they produce some of the highest yields of cotton in the U.S.

The soils of the principal agricultural area of Alaska, the Matanuska Valley, are podzols. Despite its agricultural shortcomings, the Matanuska Valley soil produces impressive crops with the aid of fertilizers and lime. The soils of Hawaii are classified as laterites or oxisols, designations that refer to highly leached and acid types of soil that are common to the tropics. Hawaiian soils are superior of their type, however, and are highly productive when fertilizers are used.

WATER RESOURCES. The rivers and lakes of the U.S. are a national asset of crucial importance. They not only form extensive networks of inland waterways, but also supply water essential for life in cities, for manufacturing operations, and for agriculture.

On the Atlantic coast many rivers, including the Hudson, Delaware, Susquehanna, Penobscot, Kennebec, Connecticut, Merrimack, Housatonic, Charles, Potomac, James, Roanoke, and the Savannah, supply water and hydroelectric power for the large industrial centers of the Atlantic seaboard. These rivers also serve as waterways, and the estuaries of some of them provide excellent natural harbors for oceangoing ships. The Appalachian Highland is the watershed between these Atlantic tidal rivers and the chief river system of the U.S., that of the Mississippi and its tributaries. The drainage basin of the Mississippi incorporates more than one third of the area of the U.S. and is its most important agricultural region. Some of the Mississippi tributaries supply water for irrigation in the semiarid lands of the Great Plains region, and many are used to generate hydroelectric power. In addition, the system includes more than 15,000 mi. of navigable waterways, providing an economical means of transport to link various agricultural and industrial districts with each other and with the Gulf of Mexico and the Atlantic Ocean. An outstanding river-development project within the Mississippi system is that operated by the Tennessee Valley Authority (q.v.), a government agency created in 1933. Through construction of a series of dams on the Tennessee R. and its tributaries, the agency opened the Tennessee to navigation as far as Knoxville, established controls against floods, which formerly ravaged the Tennessee valley, and created a power system that had an installed generating capacity in the early 1970's of more than 17,000,000 kw.

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The westernmost of the U.S. rivers belonging to the Atlantic drainage basin is the Rio Grande. This river, which forms the border between the U.S. and Mexico, is an important source of irrigation water for both countries. The w. or Pacific watershed, consisting of the Rocky Mt. region w. of the Continental Divide, is the source of two great rivers, the Colorado and the Columbia. Both of these rivers are vital sources of water for irrigation and for domestic and industrial consumption, and both supply hydroelectric power. Huge tracts of arid lands in the s.w. (see IMPERIAL VALLEY) and in the n.w. have been opened to cultivation or rendered more productive by regional river-development schemes applied to the Colorado and Columbia rivers; see RECLAMATION. Federal hydroelectric projects in the Columbia basin had an installed generating capacity in excess of 9,000,000 kw in the early 1970's.

Including the output of both Federal and private facilities, hydroelectric power accounted for about 16.5 percent of all electric power produced in the U.S. during the early 1970's. See also ELECTRIC-POWER SYSTEMS: *Power Production in the United States*; WATERPOWER.

THE PEOPLE

The U.S. is largely populated by immigrants and their descendants, plus a small minority of American Indians who represent the original inhabitants. Most of the immigration that populated the country was from Europe, but a sizable percentage of the present population are descended from Africans who were brought over as slaves, and a small proportion are Asians. This conglomerate of people live in large and small communities across the country under a government with local, State, and national levels, elected by themselves. Their education through secondary level is provided by a system of free public schools, but private educational facilities are available. Their religions are many, with facilities for worship open to all.

Population. As of April 1, 1970, the nineteenth decennial census recorded a population of 203,235,298 in the U.S.; including armed forces and civilians overseas, the population was estimated at 204,770,000 on that date. On April 1, 1975, the estimated population was 213,135,000.

The 1970 population was larger by almost 24,000,000 than that of 1960, an increase of 13.5 percent. During the 19th century the population increased at an average rate of 30.6 percent per decade, and during the first half of the 20th century it increased at a decennial rate of 14.7 percent. The U.S. population was 3,929,214 in 1790, 23,191,876 in 1850, 75,994,575 in 1900,

150,697,361 in 1950, and 179,323,175 in 1960. Growth by decade of the White, Black, and total population is shown in the accompanying table.

Year	White	Black	Total Population	Percent of Increase
1790	3,172,006	757,208	3,929,214	—
1800	4,306,446	1,002,037	5,308,483	35.1
1810	5,862,073	1,377,808	7,239,881	36.4
1820	7,866,797	1,771,656	9,638,453	33.1
1830	10,537,378	2,328,642	12,866,020	33.5
1840	14,195,805	2,873,648	17,069,453	32.7
1850	19,553,068	3,638,808	23,191,876	35.9
1860	26,922,537	4,441,830	31,443,321	35.6
1870 ¹	34,337,292	5,392,172	39,818,449	26.6
1880	43,402,970	6,580,793	50,155,783	26.0
1890	55,101,258	7,488,676	62,947,714	25.5
1900	66,809,196	8,833,994	75,994,575	20.7
1910	81,731,957	9,827,763	91,972,266	21.0
1920	94,820,915	10,463,131	105,710,620	14.9
1930	110,286,740	11,891,143	122,775,046	16.1
1940	118,214,870	12,865,518	131,669,275	7.2
1950	134,941,622	15,042,692	150,697,361	14.5
1960	158,831,732	18,871,831	179,323,175	19.0
1970	177,748,975	22,580,289	203,235,298	13.5

¹ Estimated.

DENSITY AND DISTRIBUTION. From the beginning of U.S. history the growth of population generally has outstripped the concurrent expansion of the land areas of the States. In 1790 the population density was 4.5 persons per square mile of land area, which then totaled 864,746 sq.mi. In 1850 the population density was 7.9 in a land area of 2,992,747 sq.mi.; in 1900, 25.6 in 2,969,834 sq.mi.; and in 1950, 50.6 in 2,974,726 sq.mi. In 1970 the population density was 57.5 in a land area that had been increased to 3,615,122 sq.mi. by the incorporation of Hawaii and the vast territories of Alaska.

From the beginning of European settlement of the U.S. land area, the spread of population has been from e. to w. In 1790 the population was concentrated along the Atlantic coast, and the center of population was in Maryland. Ten years later the mass movement into the north-central area of the country had begun, and at midcentury the West was beginning to be settled. By 1900 the center of population had shifted to central Ohio, by 1960 it was in the center of s. Illinois, near Centralia, and by 1970 it had moved some 30 miles w. and 9 miles s. of that point. The 1970 population was distributed as follows: 24 percent in the New England and Middle Atlantic States; 31 percent in the South Atlantic and South Central States; 28 percent in the North Central States; and 17 percent in the Western States. Throughout the 1960's the population of the Western States continued to increase at a faster rate than that in other areas. A considerable migration of people, particularly Blacks, from the South to the North has taken



U.S. Plate 7. As varied as the nation is in its geography, so too is it diverse in its population. A typical white middle-income family poses in front of their suburban home.

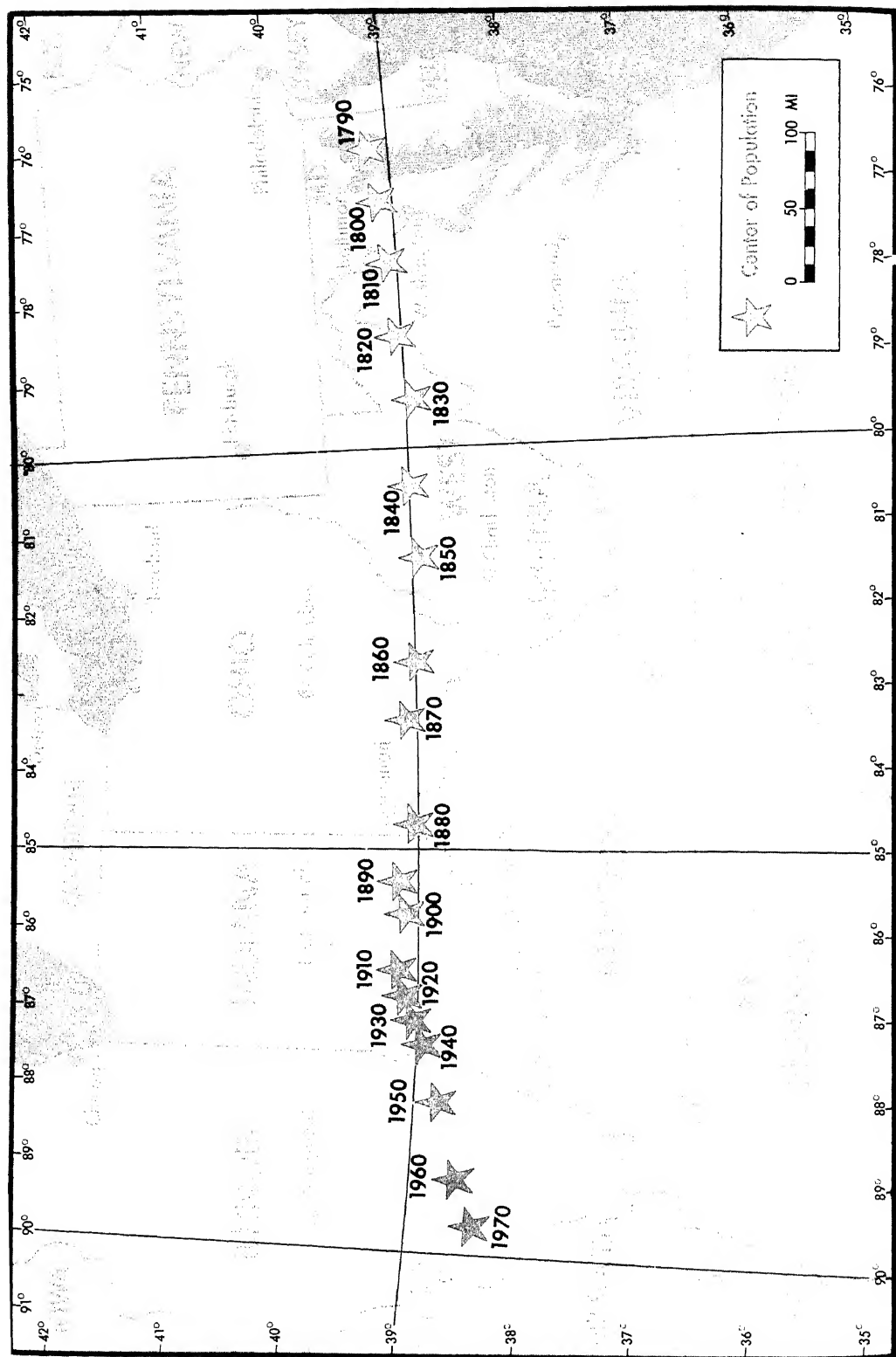
Charles Moore - Black Star



U.S. Plate 8. A black family in Mississippi shares clean but meager surroundings. Negroes, about 11 percent of the total population, are increasing their political and economic influence.

Burt Uzzle - Magnum

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The Bureau of the Census of the United States Department of Commerce established the center of population in the country, as of April 1, 1970, at a point 5 miles E.S.E. of Mascoutah, Ill., as shown on this official map.

place. Between 1940 and 1960 the percentage of the U.S. black population living in the South declined from 77 to 60, and the percentage living in the North increased from 22 to 34. By 1970, somewhat more than 39 percent of black Americans were living in the North and a little more than 53 percent in the South; almost 8 percent were living in the West, compared with 1 percent in 1940 and 6 percent in 1960.

In another aspect of the regional distribution of the population, the 1970 census revealed that about 53 percent of the population lived in counties that lie at least partly within 50 mi. of the coasts, compared with 52 percent in 1960. In 1970 about 29 percent of the coastal population lived on the Atlantic coast, 21 percent on the Pacific coast, 42 percent on the Great Lakes, and 8 percent on the Gulf of Mexico.

Another significant aspect of the U.S. population has been the trend toward urbanization. In 1790 the country was predominantly rural, with only 5.1 percent of the population living in incorporated towns and cities having at least 2500 inhabitants. By 1920 some 51 percent of the population was classified as urban, and by 1970 the percentage was 73.5, of which 8.9 percent lived in cities of more than 1,000,000 population, 20.3 percent in cities between 100,000 and 1,000,000, and the remainder in incorporated places with populations between 2500 and 100,000 and in unincorporated parts of urbanized areas. A trend that deeply changed the character of cities during the 1950's and 1960's was a large migration by middle-class families, especially Whites, away from the cities to suburban and exurban communities. The migration, which caused many cities to show a population decrease in 1970, was partly offset by the influx of Blacks, who represented about 6 percent of the population of central cities (that is, cities without their suburban rings) in 1950, 10 percent in 1960, and 12 percent in 1966. The 1970 census showed further large and widespread increases in the black populations of central cities. Four central cities—Washington, D.C.; Atlanta, Ga.; Newark, N.J.; and Gary, Ind.—had populations that were more than half black; seven other central cities had black population proportions of 40 percent or more. See also STANDARD METROPOLITAN STATISTICAL AREA.

ETHNIC AND SOCIAL CHARACTERISTICS. During the 20th century the relative proportions of the various racial groups in the population have remained practically constant. As of 1970 Whites constituted about 87.4 percent; Blacks, 11.1 percent; and other ethnic groups, about 1.4 percent of the total population. In 1970 the popula-

tion included 22,580,289 Blacks. In 1790 they comprised about 19 percent, but only about 16 percent in 1850 and 12 percent in 1900.

Important in the growth of the U.S. population has been the influx of foreign nationals. In 1970 about 4.7 percent of the total U.S. white population was foreign-born.

According to the census of 1970, foreign-born persons reported their country of birth as follows (expressed in percentages of the total foreign-born population): Italy, 10.5; Germany (West and East), 8.7; Canada, 8.4; Mexico, 7.9; Great Britain, 7.1; Poland, 5.7; Union of Soviet Socialist Republics, 4.8; Cuba, 4.6; Ireland, 2.6; and Austria, 2.2.

The median age of the U.S. population, which was 16 years of age for Whites in 1790 and 16.7 for all races in 1820, showed a steady increase until it reached a peak of 30.2 in 1950. Thereafter, it decreased to 29.5 in 1960 and to 28.1 in 1970. The long-term increase in the median age of Americans reflected a progressive lowering of death rates and lengthening of the life span as well as a generally declining birthrate over the first 150 years of U.S. history. The trend reversal shown by the 1960 data was attributed mainly to a rise in the birthrate after World War II, which was sustained until the mid-1950's, but it was also related to a leveling off of the death rate and of gains in life expectancy. In the period between 1955 and 1969 life expectancy advanced from 69.5 to 70.4 years. By comparison, in the four and a half decades before 1955, 22.2 years had been added to the expected life span. By 1972, it had reached 71.2 years. As already noted, the birthrate is an important factor in determining the age composition of a population. At the beginning of the 20th century the birthrate was about 30 per 1000 population. Over the first three decades of the century the birthrate declined steadily to a low of about 16.6 in 1933, and it remained under 20 through the 1930's and the early 1940's. In the mid-1950's it rose to a high of 24; subsequently it underwent a progressive decline to 18.2 in 1970 and a record 15.6 in 1972. The birthrate of non-Whites has been consistently higher than that of Whites in the U.S. The mortality rate, generally higher for males than for females and for non-Whites than Whites, declined during the 20th century from an estimated 17.2 per 1000 of population in 1900 to 9.3 in 1955. Throughout the 1960's and into the early 1970's it ranged from 9.3 to 9.6.

As a result of these trends in birth and death rates, the proportion of elderly persons in the U.S. population has shown a marked increase. In 1970 persons 65 years of age and over made

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up 9.9 percent of the total resident population, compared with 9.2 percent in 1960.

Families in the U.S. as of 1970 numbered about 51,240,000, and the average household consisted of 3.1 persons, compared with 4.9 in 1890.

The proportion of married persons has increased during the 20th century. In 1890 about 52 percent of males 14 years old and over and about 55 percent of females 14 years old and over were married; in 1970 about 67 percent of males and 62 percent of females over 14 years old were married. The proportion of divorced persons has increased more substantially. In 1890 only 0.2 percent of males and 0.4 percent of females were divorced, compared with 2.2 percent of males and 3.5 percent of females in 1970. At the beginning of the century the divorce rate was less than one per 1000 population; in 1970 it was 3.5.

See also AMERICAN INDIANS: *Indians of the United States and Canada*; NEGROES IN THE UNITED STATES.

Political Divisions. Besides the fifty States and the District of Columbia, which are alphabetically listed in the accompanying table, the political divisions of the U.S. comprise the Commonwealth of Puerto Rico and the following possessions: American Samoa, Guam, Panama Canal Zone, and Virgin Islands of the United States. Each U.S. possession and Puerto Rico, which are listed in the accompanying table (page 57), each of the States, and the District of Columbia are discussed in separate articles. For American Samoa, see SAMOA, AMERICAN.

Principal Cities. The capital of the United States is Washington, which is coextensive with the District of Columbia, the Federal District. According to the census of 1970, the U.S. has 64 cities, besides the national capital, with more than 200,000 inhabitants. These cities, which are described in separate articles, are listed in the accompanying table in descending order of population.

In 1970, 18,666 incorporated municipalities were reported by the Census Bureau, compared with 18,088 counted in the census of 1960. Of these municipalities, 6 had populations of 1,000,000 or more; 20 had between 500,000 and 1,000,000; and 30 had populations between 250,000 and 500,000. This represented an upward change since 1960, when corresponding figures were 5, 16, and 30 in the population ranges mentioned. See table in next column.

Religion. The religious affiliations of the inhabitants of the British colonies that formed the nucleus of the U.S. varied from region to region.

Cities	Population (1970)	Cities	Population (1970)
New York, N.Y.	7,895,563	Fort Worth, Texas	393,476
Chicago, Ill.	3,366,957	Toledo, Ohio	383,818
Los Angeles, Calif.	2,816,061	Portland, Ore.	382,619
Philadelphia, Pa.	1,948,609	Newark, N.J.	382,417
Detroit, Mich.	1,511,482	Oklahoma City, Okla.	366,481
Houston, Texas	1,232,802	Oakland, Calif.	361,561
Baltimore, Md.	905,759	Louisville, Ky.	361,472
Dallas, Texas	844,401	Long Beach, Calif.	358,633
Washington, D.C.	756,510	Omaha, Nebr.	347,328
Cleveland, Ohio	750,903	Miami, Fla.	334,859
Indianapolis, Ind.	744,624	Tulsa, Okla.	331,638
Milwaukee, Wis.	717,099	Honolulu, Hawaii	324,871
San Francisco, Calif.	715,674	El Paso, Texas	322,261
San Diego, Calif.	696,769	Saint Paul, Minn.	309,980
San Antonio, Texas	654,153	Norfolk, Va.	307,951
Boston, Mass.	641,071	Birmingham, Ala.	300,910
Memphis, Tenn.	623,530	Rochester, N.Y.	296,233
Saint Louis, Mo.	622,236	Tampa, Fla.	277,767
New Orleans, La.	593,471	Wichita, Kans.	276,554
Phoenix, Ariz.	581,562	Akron, Ohio	275,425
Columbus, Ohio	539,677	Tucson, Ariz.	268,933
Seattle, Wash.	530,831	Jersey City, N.J.	260,545
Jacksonville, Fla.	528,805	Sacramento, Calif.	254,413
Pittsburgh, Pa.	520,117	Austin, Texas	251,808
Denver, Colo.	514,678	Richmond, Va.	249,621
Kansas City, Mo.	507,087	Albuquerque, N. Mex.	243,751
Atlanta, Ga.	496,973	Dayton, Ohio	243,601
Buffalo, N.Y.	462,768	Charlotte, N.C.	241,178
Cincinnati, Ohio	452,524	Saint Petersburg, Fla.	216,232
Nashville, Tenn.	447,877	Corpus Christi, Texas	204,525
San Jose, Calif.	445,779	Yonkers, N.Y.	204,370
Minneapolis, Minn.	434,400	Des Moines, Iowa	200,587

In the New England area the dominant faith was Congregationalism (q.v.), established by Separatist and Puritan groups who were dissidents from the Church of England (q.v.); the South Atlantic region adhered officially to the Church of England; and the Middle Atlantic region was a haven for various sects and creeds (q.v.).

The New England Separatists and Puritans came to the New World in order to worship in their own way without interference from the Church of England. The first group to reach New England were the Separatists called the Pilgrim Fathers (q.v.), who in 1620 founded the Colony of New Plymouth; see PLYMOUTH COLONY. The New Plymouth colony, with its church, was absorbed eventually by the more powerful Massachusetts Bay Colony, founded in 1629 by Puritans.

The churches of the Puritans were organized as separate congregations, each bound together by a covenant (q.v.) taken by its members. From this emphasis on Congregationalism, the organized church of the New England Puritans derived its name. Religion was the focal point of social and political life in New England. Until 1691 the Massachusetts Bay Colony was a theocracy (q.v.) in which church attendance was compulsory and church membership a qualification for voting and holding office. Non-Congregationalist denominations, notably the

POLITICAL DIVISIONS OF THE UNITED STATES

States and District of Columbia	Area ¹ (sq. mi.)	Area Rank	Population (1970)	Year & Order of Admission to Union		Capital
Alabama	51,609	29	3,444,165	1819	22	Montgomery
Alaska	586,412	1	309,173	1959	49	Juneau
Arizona	113,909	6	1,779,482	1912	48	Phoenix
Arkansas	53,104	27	1,923,295	1836	25	Little Rock
California	158,693	3	19,953,134	1850	31	Sacramento
Colorado	104,247	8	2,207,259	1876	38	Denver
Connecticut	5,009	48	3,032,217	1788 ²	5	Hartford
Delaware	2,057	49	548,104	1787 ²	1	Dover
District of Columbia	67	51	756,510	1791	.	.
Florida	58,560	22	6,789,443	1845	27	Tallahassee
Georgia	58,876	21	4,589,575	1788 ²	4	Atlanta
Hawaii	6,450	47	769,913	1959	50	Honolulu
Idaho	83,557	13	713,008	1890	43	Boise
Illinois	56,400	24	11,113,976	1818	21	Springfield
Indiana	36,291	38	5,193,669	1816	19	Indianapolis
Iowa	56,290	25	2,825,041	1846	29	Des Moines
Kansas	82,264	14	2,249,071	1861	34	Topeka
Kentucky	40,395	37	3,219,311	1792	15	Frankfort
Louisiana	48,523	31	3,643,180	1812	18	Baton Rouge
Maine	33,215	39	993,663	1820	23	Augusta
Maryland	10,577	42	3,922,399	1788 ²	7	Annapolis
Massachusetts	8,257	45	5,689,170	1788 ²	6	Boston
Michigan	58,216	23	8,875,083	1837	26	Lansing
Minnesota	84,068	12	3,805,069	1858	32	Saint Paul
Mississippi	47,716	32	2,216,912	1817	20	Jackson
Missouri	69,686	19	4,677,399	1821	24	Jefferson City
Montana	147,138	4	694,409	1889	41	Helena
Nebraska	77,227	15	1,483,791	1867	37	Lincoln
Nevada	110,540	7	488,738	1864	36	Carson City
New Hampshire	9,304	44	737,681	1788 ²	9	Concord
New Jersey	7,836	46	7,168,164	1787 ²	3	Trenton
New Mexico	121,666	5	1,016,000	1912	47	Santa Fe
New York	49,576	30	18,190,740	1788 ²	11	Albany
North Carolina	52,586	28	5,082,059	1789 ²	12	Raleigh
North Dakota	70,665	17	617,761	1889	39	Bismarck
Ohio	41,222	35	10,652,017	1803	17	Columbus
Oklahoma	69,919	18	2,559,253	1907	46	Oklahoma City
Oregon	96,981	10	2,091,385	1859	33	Salem
Pennsylvania	45,333	33	11,793,909	1787 ²	2	Harrisburg
Rhode Island	1,214	50	949,723	1790 ²	13	Providence
South Carolina	31,055	40	2,590,516	1788 ²	8	Columbia
South Dakota	77,047	16	666,257	1889	40	Pierre
Tennessee	42,244	34	3,924,164	1796	16	Nashville
Texas	267,339	2	11,196,730	1845	28	Austin
Utah	84,916	11	1,059,273	1896	45	Salt Lake City
Vermont	9,609	43	444,732	1791	14	Montpelier
Virginia	40,817	36	4,648,494	1788 ²	12	Richmond
Washington	68,192	20	3,409,169	1889	40	Olympia
West Virginia	24,181	41	1,744,237	1863	35	Charleston
Wisconsin	56,154	26	4,417,933	1848	30	Madison
Wyoming	97,914	9	332,416	1890	44	Cheyenne
	3,615,123		203,184,772			
Outlying Areas	Area¹ (sq. mi.)		Population (1970)	Year		Capital
Puerto Rico	3,435		2,712,033	1899 ³		San Juan
Guam	212		84,996	1899 ³		Agaña
American Samoa	76		27,159	1900 ³		Pago Pago
Panama Canal Zone	553		44,198	1904 ³		Balboa Heights
Virgin Islands	133		62,468	1917 ³		Charlotte Amalie
	4,409					

¹ Includes inland water surface.² Year of ratification of the Constitution of the United States.³ Year of acquisition.

Baptist and Quaker, were regarded with hostility and often persecuted by the colonial government. Noteworthy among those who rebelled against this alliance between church and state was Roger Williams, who in 1636 left the Massachusetts Bay Colony and founded Providence in what is now the State of Rhode Island. Williams, whose colony became a haven for all creeds, established the first Baptist church in America in 1639; see BAPTIST.

In the South Atlantic coastal region, which

comprised Virginia, North Carolina, South Carolina, and Georgia, the Church of England was the established church, and all settlers were required to pay taxes for its support. Clergymen of non-Anglican denominations, for example, Baptist and Presbyterian, often were prohibited from preaching and performing marriage ceremonies.

The Middle Atlantic colonies provided a more congenial climate for freedom of religion than did the New England and South Atlantic colo-

Text continued on page 64



Burk Uzzle - Magnum

U.S. Plate 9. The culture of a nation is forged by the union of land and people. In the 1970 census nearly 75 percent of America's population was classified as urban. In a not-uncommon city scene (left), a sidewalk becomes a classroom, the result of school buildings crowded beyond their usefulness. Two other typical urban-sprawl scenes are construction workers (below) and (bottom) the rapidly moving crowd.



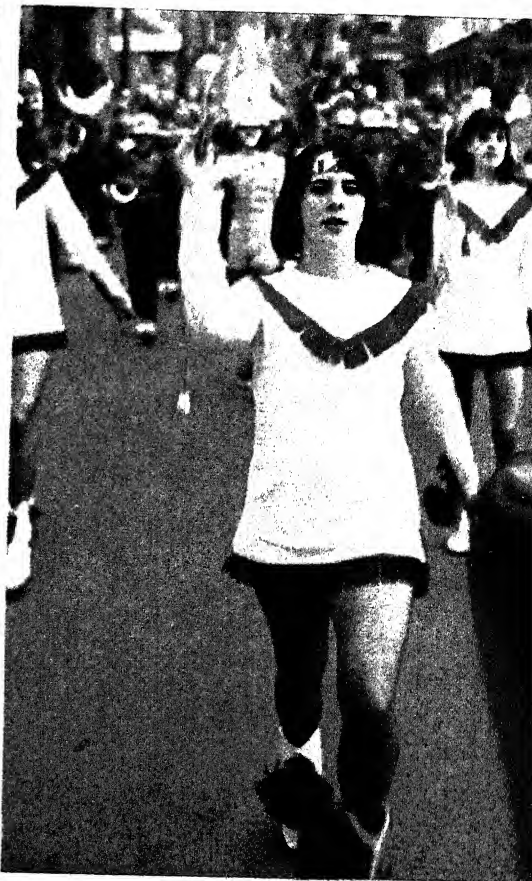
Doug Wilson - Black Star



Ernest Baxter - Black Star



Charles Harbutt - Magnum



John Launois - Black Star

U.S. Plate 10. The people of rural America: a rancher's wife (above, left) peeling tomatoes at a county fair; drum majorettes (above, right) stepping ahead of a small town's annual parade; a pipe-smoking farmer (below) with younger townsfolk.

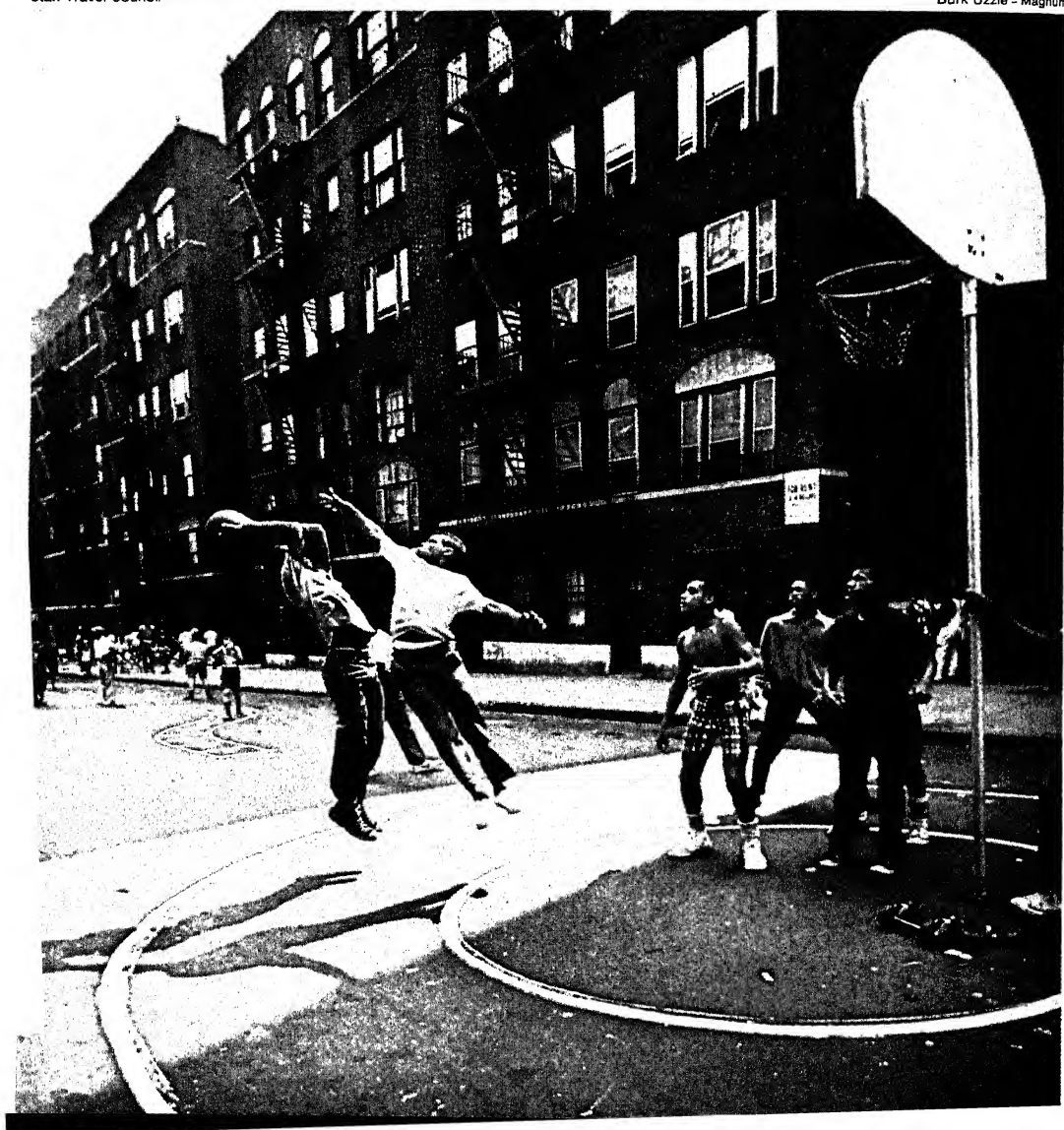


Burk Uzzie - Magnum



Utah Travel Council

U.S. Plate 11. Perhaps America's greatest resource is her children. Patterns of growth, development, and adaptation are modified by a great variety of environmental circumstances. Left: Sandcastle construction at Great Salt Lake, Utah. Below: Basketball on an inner-city street.



Burk Uzzle - Magnum

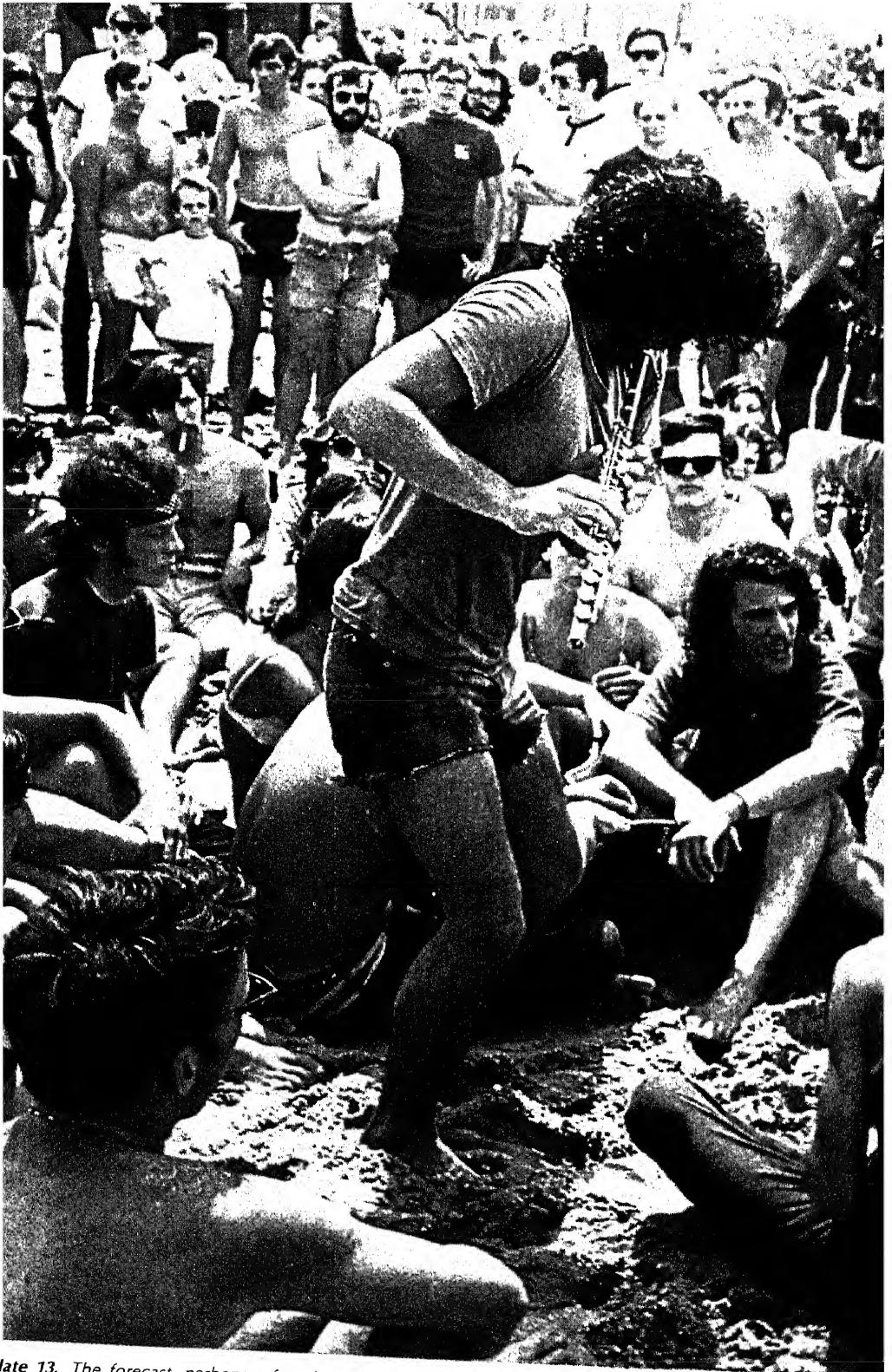
U.S. Plate 12. Sports are an important part of the American way of life with people of all ages each year switching from the role of spectator to that of participant. Enthusiasm for skiing (right) grows in mountainous areas where the snowfall is sufficiently reliable. In the Southwest, rodeos (below) are a popular entertainment.



Swenson - New Hampshire State Division of Economic Development

Texas Highway Development





U.S. Plate 13. The forecast, perhaps, of a change in the country's future, America's emerging generation has triggered nationwide re-evaluation and, in many instances, adjustment of political, economic, and social goals. The group's intensity is expressed in the words and sounds of their music.

Roger Malloch - Magnum



U.S. Plate 14. The high productivity of America's economic system has resulted in more leisure time for her citizens. Sailing is popular as both a recreation and a sport.

Charles Moore - Black Star

nies. The first European settlers of the Middle Atlantic region were the Dutch, who first founded trading posts along the Hudson R. about 1613. They founded the colony of New Netherland in 1625, bringing to it the beliefs and practices of the Reformed Church; see REFORMED CHURCH IN AMERICA, THE. The first organized group of Jewish settlers in North America arrived in New Amsterdam, the capital of New Netherland, in 1654. After New Netherland was seized (1664) by the British, the Church of England became influential there, and by 1700 it was the established church of the four most populous counties of New York. Delaware and New Jersey, which had been parts of New Netherland, maintained a complete separation of church and state. The territory now comprising Maryland was granted in 1632 to the Calvert (see *under* CALVERT) family, who were English Roman Catholics. Members of the family colonized the region in 1634 with the aim of providing a haven for their persecuted coreligionists; eventually Anglicanism was made the established religion of Maryland. Pennsylvania, under the terms of a charter granted in 1681, was founded by the English Quaker William Penn as a haven for adherents of all religions; see FRIENDS, SOCIETY OF. Lutheranism (q.v.) was established during the colonial period in Pennsylvania, New York, and Delaware. Presbyterianism (q.v.) was introduced on a large scale into the Middle Atlantic colonies by Scottish and Scotch-Irish settlers during the late 17th and early 18th centuries. Methodists settled in the Middle Atlantic region, notably in New York, during the latter half of the 18th century; see METHODISM; UNITED METHODIST CHURCH, THE.

A liberalizing influence on the religion of colonial America was the revivalist movement known as the Great Awakening, which developed in the middle of the 18th century. Inspired by the evangelical preaching of several ministers, most prominently the Congregationalist clergyman Jonathan Edwards in New England, the Presbyterian minister Gilbert Tennent (1703–64) in the Middle Atlantic region, and the visiting British evangelist George Whitefield, the movement spread eventually to all of the colonies. The general effect of the Great Awakening was to increase the strength of the Methodist and Baptist denominations and to pave the way for the separation of church and state when the U.S. was founded as an independent nation. See REVIVALS, RELIGIOUS.

The adoption in 1788 of the Constitution of the United States marked the beginning of a new era in American religion. The First Amend-

ment states that "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof". After the adoption of the Constitution those States with established religions gradually eliminated their church-state ties; the last State to do so was Massachusetts, which disestablished its church in 1833.

During the first half of the 19th century the population of the U.S. was overwhelmingly Protestant; it included relatively few Catholics and Jews and almost no adherents of such non-Christian religions as Islam and Buddhism (qq.v.). The first Roman Catholic bishop in the U.S. was John Carroll, bishop of Baltimore. The number of Roman Catholics was increased greatly beginning about 1820 by the arrival of large numbers of Irish immigrants; as a result of potato famines more than 1,000,000 persons emigrated from Ireland to the U.S. between 1845 and 1855; see ROMAN CATHOLIC CHURCH. Following the unsuccessful popular uprisings of 1848 in Germany, large numbers of German Lutherans emigrated to the U.S. In the latter half of the century most of the immigration was from countries in southern and eastern Europe, notably Italy, Austria, Hungary, and Russia, from which came large numbers of Catholics and Jews; see JEWS: *Jews in Modern Life*.

Among the religious developments of the 19th century was the founding of several indigenous American denominations, among which were the Church of Jesus Christ of Latter-day Saints, known popularly as the Mormons (q.v.), the Church of Christ, Scientist (see CHRISTIAN SCIENCE), the Seventh-Day Adventist Church, and Jehovah's Witnesses (qq.v.). Within the major denominations, slavery (q.v.) and other social questions were important issues in church affairs, resulting in sectional divisions and fragmentation of church bodies.

During the first two decades of the 20th century, immigration from Europe continued to be heavy and to include a large percentage of Jews and Catholics. Beginning in 1921, however, Congress passed a series of laws that sharply curtailed immigration from south-central and eastern Europe; see IMMIGRATION. Thereafter the religious composition of the U.S. population ceased to be modified significantly by immigration and tended to become stabilized. The denominational divisions of the 19th century were reversed in many instances as the 20th century continued; see ECUMENICAL MOVEMENT.

Organized religion in the U.S. encompasses about 230 religious bodies, most of which are small Protestant sects with memberships of less

than 50,000. According to a semiofficial report on American churches, the membership of all religious bodies in the U.S. during the early 1970's was about 131,000,000. The Roman Catholic Church, with about 48,215,000 members, including children under thirteen years of age, is the largest single Christian denomination in the U.S. Protestant denominations, numbering almost 200, have an aggregate membership of about 71,715,000. Among the larger Protestant bodies, in descending order of size, are Baptist, Methodist, Lutheran, and Presbyterian denominational groupings, the Protestant Episcopal Church, Churches of Christ, Church of Jesus Christ of Latter-day Saints (Mormons), United Church of Christ, the Christian Church (Disciples of Christ), and Assemblies of God. The bodies making up the Orthodox Church (q.v.) in the U.S. have a combined membership of about 3,850,000. The largest non-Christian denomination in the U.S. is the Jewish, with about 5,870,000 members.

Cooperative work among the churches in the U.S. is carried on by various interdenominational bodies, among them the National Council of the Churches of Christ in the United States of America (q.v.). Some churches belong to the World Council of Churches (q.v.), which works on the international and interdenominational levels.

For other matters concerning religion in the U.S., see separate articles, for example, *FUNDAMENTALISM*; *MISSIONARY MOVEMENTS*.

Education. In the U.S. education is provided at all levels by both public and private institutions. Jurisdiction over education is decentralized, with each State having its own system of free public schools and regulatory power over private schools within its borders. All of the States have established general guidelines covering such matters as qualifications for teachers, basic curricular requirements, and compulsory school attendance, but the actual operation of schools in a locality is largely left to the discretion of local boards of education. See *EDUCATION IN THE UNITED STATES*.

Decentralization has resulted in some differences in standards and a considerable variety in the quality of schools from State to State and from locality to locality. With all its variations, the system has succeeded in minimizing illiteracy, which stood at only 1.0 percent in the late 1960's. Quantitatively, it has provided progressively more extended schooling for the U.S. population. In 1947 only one third of the population over the age of 25 had completed high school and only 5 percent had attended college

for four or more years. In 1960 the percentage of the population over 25 years of age who had completed high school had jumped to 41 percent, and in 1970 it passed the halfway mark, reaching 55 percent. The percentage of the population over 25 who had attended four or more years of college exceeded 7 percent by 1960 and reached 11 percent in 1970.

One of the traditional premises of U.S. education has been the separation of the public-school system from any suggestion of Federal control, a separation that has been defended as a means of preventing the schools from becoming instruments of political indoctrination for the government in power. This traditional antipathy to interference by the national government in school affairs has confined Federal participation in education mainly to financial support and advisory functions; see *EDUCATION, ADULT*; *EDUCATION, OFFICE OF*; *LAND-GRANT COLLEGES*. In a few exceptional cases, however, the Federal government has become directly involved in education. Schools for Indians, which numbered about 215 in the late 1960's, are administered by the Federal Bureau of Indian Affairs. The national government also has taken responsibility for providing free schools at some Federal installations. In addition, the Federal government has occasionally intervened directly to promote racial desegregation of schools; see *History*, below.

ELEMENTARY AND SECONDARY EDUCATION. Elementary and secondary education in the U.S. involves twelve years of schooling, the successful completion of which leads to a high-school diploma. The school systems that provide such education usually are organized according to one of three plans as follows: the 6-6 plan, which divides schooling into 6 elementary grades and 6 high-school grades; the 6-3-3 plan, which divides schooling into 6 elementary grades, 3 junior-high grades, and 3 senior-high grades; and the 8-4 plan, which divides schooling into 8 elementary grades and 4 high-school grades. The 8-4 plan has been the usual method for organizing schools in rural communities, where children attended a small country school and occasionally went on to high school in the nearest town. Today, with increasing urbanization and the elimination of country schools, the 6-3-3 and 6-6 plans are more prevalent.

Public-School Systems. In the early 1970's some 67,000 elementary and 24,000 secondary schools were providing public education in the U.S. In 1970 elementary enrollment totaled about 34,000,000 and secondary enrollment about 14,750,000. Teachers numbered about

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1,140,000 in elementary schools and 950,000 in secondary schools in 1972.

In spite of the decentralized nature of U.S. education, the public-school systems of the various States have become generally standardized with respect to such features as the administrative structure of schools, curricula, and compulsory attendance; see EDUCATION, ELEMENTARY; EDUCATION, SECONDARY. Less uniformity exists among the States, however, on such matters as annual expenditures per pupil and teachers' salaries, both of which bear a relationship to the overall quality of the schools. The annual expenditure per pupil for the entire U.S. averaged \$930 in 1972. Thirty-two States spent less than the national average, with the lowest expenditure, an average of \$543 per pupil, being paid by Alabama. The highest expenditure, averaging \$1466 per pupil, was made by New York. Annual salaries for teachers in 1972 averaged \$9690 for the country as a whole, with twenty-six States paying salaries averaging \$9000 or more and twelve States paying salaries averaging under \$8000. Teachers' salaries were highest in Alaska, California, Michigan, and New York, with an annual average of more than \$11,000.

Private Schools. In the early 1970's some 14,400 private schools offered elementary schooling and some 4200 offered secondary education. In the early 1970's about 4,200,000 elementary pupils and 1,400,000 secondary pupils were enrolled in private schools. The teaching staffs totaled about 200,000. The largest system of private education in the U.S. is maintained by the Roman Catholic Church. In 1971 it maintained about 10,000 elementary and 1800 secondary schools, with an aggregate enrollment of about 4,100,000. Besides the schools for general education, many private vocational schools in the U.S. provide commercial and technical training. **UNIVERSITIES AND COLLEGES.** Institutions of higher education included more than 2500 public and private colleges and universities in the early 1970's. Enrollment totaled about 8,500,000 in the early 1970's, and faculty members numbered more than 560,000. Most of the public institutions are under the authority of State, county, or municipal governments; a few are Federally controlled, most notably the national military academies and graduate schools connected with Federal agencies. Many of the private colleges and universities were founded by religious bodies, and some remain under the legal control of such bodies. The Roman Catholic Church, for example, maintains about 700 institutions of higher learning, including colleges for men, colleges for women, and seminaries.

Most of the largest universities, however, are autonomous. For the purpose of maintaining some degree of control over standards in the institutions of higher education, a system of accreditation has been developed. Six regional accrediting associations evaluate the programs of liberal arts colleges, and professional schools are evaluated by appropriate professional associations. See EDUCATION, HIGHER.

Culture. The indigenous peoples of what is now the U.S. were the American Indians, the Eskimos, and the Hawaiians. The Indians, scattered over North America and numbering about 800,000 when the first European explorers arrived, showed a diversity of culture and language. Their influence on subsequent American culture, however, has been negligible; see AMERICAN INDIANS: *Indians of the United States and Canada*; ARCHEOLOGY: *Current Research*; ESKIMO; POLYNESIANS.

The colonists were virtually all Europeans, mostly British (in 1790, at the time of the first U.S. census, almost 70 percent of the population were of British descent). They came desiring political and religious freedom, developed institutions of representative government during the colonial period, and in consequence of their hardy frontier way of life became strong believers in the individual dignity and equality of men. Their ideals, feelings, and beliefs found eloquent expression in the Declaration of Independence, the Constitution of the United States, and the Bill of Rights. Their language became the official language of the U.S., and the literary influence of England predominated from the colonial period through the 19th century. See also COLONIAL LIFE IN NORTH AMERICA.

The masses of people from all parts of Europe who emigrated to the U.S. in the 19th and early 20th centuries were drawn, too, by the promise of a new, freer life. Working the land or seeking opportunity for betterment in the expanding industries of America, they formed in time a heterogeneous society, in which almost every nationality, race, and belief was represented. Their assimilation into American life has been described by the term "melting pot"; but every group of immigrants, and to varying degrees its descendants, has retained distinctive elements of its original customs and way of life. This has been particularly true of the Spanish-speaking population that reached the U.S. in the middle of the 20th century.

Such heterogeneity has had its unfortunate effects, including occasional local disputes or violence between ethnic groups, and on a national scale racial discrimination against the

Negro. The American Negro has created cultural forms expressive of his unique experiences; see *AFRO-AMERICAN MUSIC*; *JAZZ*; *NEGRO-AMERICAN FOLK-LORE*.

Geography has exerted a considerable formative influence on American culture. The Atlantic Ocean, separating North America from Europe by 3000 mi., initially safeguarded Americans from direct involvement in European movements, wars, and political quarrels. Such a barrier naturally intensified the feeling of separation from Europe and the sense of America's newness and uniqueness. It also allowed Americans to develop a decentralized, relatively open, nonmilitary society. At other times, of course, the ocean served as a pathway for immigrants and trade.

The vast size of the continental U.S. has had an equally powerful influence on American cultural development. The original thirteen colonies occupied merely the fringe of a huge land mass. Everything beyond constituted the frontier, a place of danger and hard toil, yet above all a place for individual opportunity. The conquest of the frontier meant national expansion, economic growth, and the opening of a tremendous free-trade area for American industry. It brought, too, increased social mobility and equalitarian political developments. The optimistic belief in progress, still a marked American trait, originated partly in the mastery of the frontier.

Intensive utilization of the immense store of resources available in the U.S. is the geographic factor that has most radically transformed American culture since colonial times. The land, forests, inland waterways, and the ocean, exploited first, provided the basis for a flourishing agricultural and trading society. In the 19th and 20th centuries, the nation's mineral and energy resources were exploited in the course of industrialization of the American economy. As direct results of this utilization of natural resources, a largely agrarian way of life was supplanted by a highly industrial culture; a predominantly rural population was transformed into an increasingly urban one; and specialized skills and scientific knowledge were developed for the establishment and maintenance of a mechanized, technological culture. In the development of technology American inventiveness played a remarkable part, aided by the American emphasis on the value of universal education.

Indirect effects of industrialism on American culture include even greater mobility in a perennially restless people as modern transportation means have facilitated movement; uniquely

American contributions to the arts, especially modern urban architecture; and for the average person a greater amount of leisure time resulting from increased productivity.

A particularly American use of leisure time is participation in active sports, although a largely urban population has increasingly devoted itself to watching the performances of professional athletes. See separate article on individual sports.

ART AND ARCHITECTURE. See *AMERICAN ARCHITECTURE*; *AMERICAN PAINTING*; *AMERICAN SCULPTURE*.

LANGUAGE. See *AMERICANISMS*; *ENGLISH LANGUAGE*.

LIBRARIES AND MUSEUMS. See *LIBRARY*; *LIBRARY OF CONGRESS*; *MUSEUM*; *SMITHSONIAN INSTITUTION*.

LITERATURE. See *AMERICAN LITERATURE*; *DRAMA: National Drama: United States*.

MUSIC. See *AMERICAN MUSIC*; *MUSICAL*; *OPERA: The Late 19th and 20th Centuries*; *POPULAR MUSIC*.

THE ECONOMY

Further information on the industries and various sectors of the economy will be found in individual articles; for example, see *MINING*; *TRANSPORTATION*.

Although the U.S. ranks fourth in land area and fourth in population among the countries of the world, it possesses the most productive economy of all. It ranks first in the total volume of industrial production and is one of the foremost agricultural nations. Through the first half of the 1970's the U.S. was producing about half of the world's annual output of automobiles and about a third of other motor vehicles. With yearly variations it produced about a quarter of the world's annual output of iron and steel and about a third of the annual production of plastics. The U.S. also led in the production of electric energy, petroleum, synthetic fabrics, meat, and a variety of other commodities. The nation held a leading position in the scientific and technological revolution that brought about the age of atomic energy, computers, and space travel, in addition to biological advances.

The present economic preeminence of the U.S. has its roots in the industrial revolution that transformed the country in the second half of the 19th century. Until 1860 agriculture was the main occupation of the people, but manufacturing had been gradually gaining a foothold, particularly after the War of 1812. The main surge of industrial development in the U.S. began after the Civil War; it is estimated that production was increased nearly threefold between 1869 and 1899. During that period the country was opened up for industrial development by the building of the transcontinental railroad, and the steel and petroleum industries

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became well established. By the late 19th century large industrial combinations were beginning to dominate the economy, and the U.S. was entering into competition with other industrialized nations for foreign markets. In the early part of the 20th century economic growth was stimulated by World War I and by certain revolutionary developments, particularly electricity, automobiles, and radio. The economy suffered a major setback during the depression of the 1930's but surged forward at an unprecedented rate during the early 1940's under the stimulus of World War II. After a period of readjustment following the war, economic growth proceeded at a rate averaging about 3.3 percent annually between 1950 and 1970. In 1974 the gross national product totaled about \$1,397,000,000,000, and represented a volume of production nearly five times that of 1950 and more than double that of 1960; see NATIONAL INCOME.

Manufacturing. Mass production and the factory system were introduced into the U.S. in the latter part of the 18th century, most notably by Samuel Slater (1768-1835), who designed the first mechanized cotton-spinning mill, Oliver Evans, who installed several automatic devices in his flour mill, and Eli Whitney, who applied the principles of mass production to the manufacture of muskets. Cotton-textile mills were the most important of the manufacturing industries before the Civil War; other early industries included iron smelting, the manufacture of small metal products, flour milling, and whiskey making. Most of the manufacturing was concentrated in the North, a circumstance that gave the region an economic advantage over the South during the Civil War. The war stimulated further industrial development in the North and marked the real beginning of the industrial revolution in the U.S.

As industrialization progressed, business power became concentrated increasingly in the hands of a few financial magnates. By the end of the 19th century public leaders were becoming concerned about the growth of monopolies and trusts, and State and Federal governments began to pass laws to regulate big business. In the second decade of the 20th century, American industry was called upon to produce goods for domestic and foreign use that previously had been supplied by Europe and to provide equipment and supplies for World War I. The growth of manufacturing output during this period is reflected by statistics on the value added by manufacture, which increased from \$8,162,000,000 in 1909 to \$23,735,000,000 in 1919.

After a brief postwar depression, U.S. industry expanded throughout most of the 1920's, then stagnated during the Great Depression that followed in the 1930's. In 1929 the value added by manufacture totaled \$30,591,000,000, and in 1939, six years after the trough of the depression, the value added was only \$24,682,000,000. During World War II, however, industrial production rose by 90 percent between 1940 and 1943. By 1947, the value added by manufacture totaled \$74,290,000,000.

In 1976 manufacturing accounted for about one fourth of the national income. Manufacturing establishments, which numbered some 312,000 in the mid-1970's, employed some 18,300,000 persons and yearly added some \$441,850,000,000 to the value of the products they processed. The accompanying table, based on statistics issued by the Office of Management and Budget for 1975, indicates the diversity and magnitude of U.S. manufacturing. See also FACTORIES AND THE FACTORY SYSTEM.

Agriculture. At one time the prevailing way of life in the U.S., farming now supports only

Text continued on page 73

Industry	Number of Production Workers	Production Workers' Total Wages	Value Added by Manufacture
Food and kindred products	1,057,000	\$ 9,861,000,000	\$ 48,142,000,000
Tobacco products	56,000	513,000,000	3,722,000,000
Textile mill products	728,000	4,932,000,000	12,110,000,000
Apparel and other textile products	1,057,000	5,762,000,000	13,381,000,000
Lumber and wood products	509,000	4,079,000,000	10,456,000,000
Furniture and fixtures	327,000	2,349,000,000	6,311,000,000
Paper and allied products	454,000	4,873,000,000	17,927,000,000
Printing and publishing	630,000	6,253,000,000	24,504,000,000
Chemicals and allied products	511,000	5,871,000,000	45,116,000,000
Petroleum and coal products	98,000	1,356,000,000	10,090,000,000
Rubber and plastics products	453,000	4,002,000,000	13,674,000,000
Leather and leather products	209,000	1,252,000,000	3,187,000,000
Stone, clay, and glass products	464,000	4,601,000,000	15,338,000,000
Primary metal industries	856,000	11,047,000,000	30,554,000,000
Fabricated metal products	1,073,000	11,048,000,000	34,096,000,000
Nonelectrical machinery	1,350,000	14,854,000,000	51,471,000,000
Electric and electronic equipment	1,018,000	9,628,000,000	34,804,000,000
Transportation equipment	1,138,000	14,419,000,000	45,155,000,000
Instruments and related products	310,000	2,835,000,000	14,116,000,000
Miscellaneous manufacturing	303,000	2,174,000,000	7,696,000,000
Totals	12,601,000	\$121,709,000,000	\$441,850,000,000

U.S. Plate 15. Slightly less than half of the total land area of the U.S. is farmland: in the northern Plains States, more than 95 percent of the region; in the South, about 62 percent; in the West, some 45 percent; and in Alaska, less than 1 percent. Wheat production is centered in the Great Plains; abundant North Dakota harvests (right) rank the State second nationally in wheat growing. Cattle are raised largely on the so-called range, generally considered to be the area west of the 100th meridian; some Hereford (below), a popular beef variety, are bred on Montana farms.



Harley Hettick - North Dakota Travel Dept.

Bill Browning - Montana Chamber of Commerce



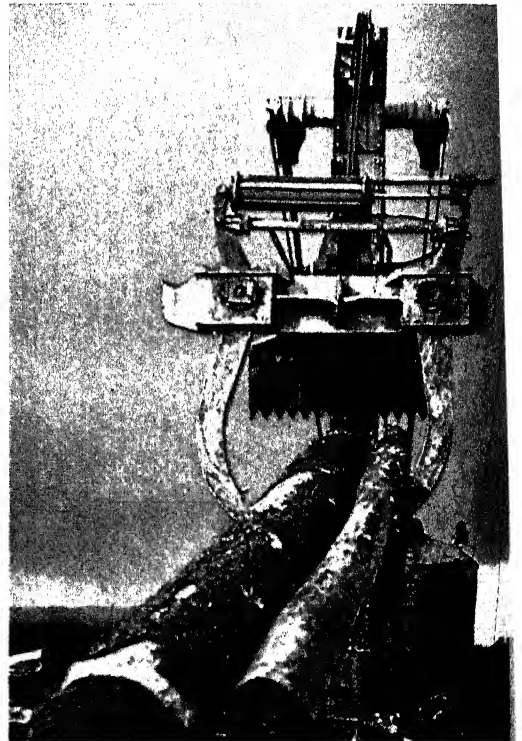


Fred Ward - Black Star
Cornell Capa - Magnum

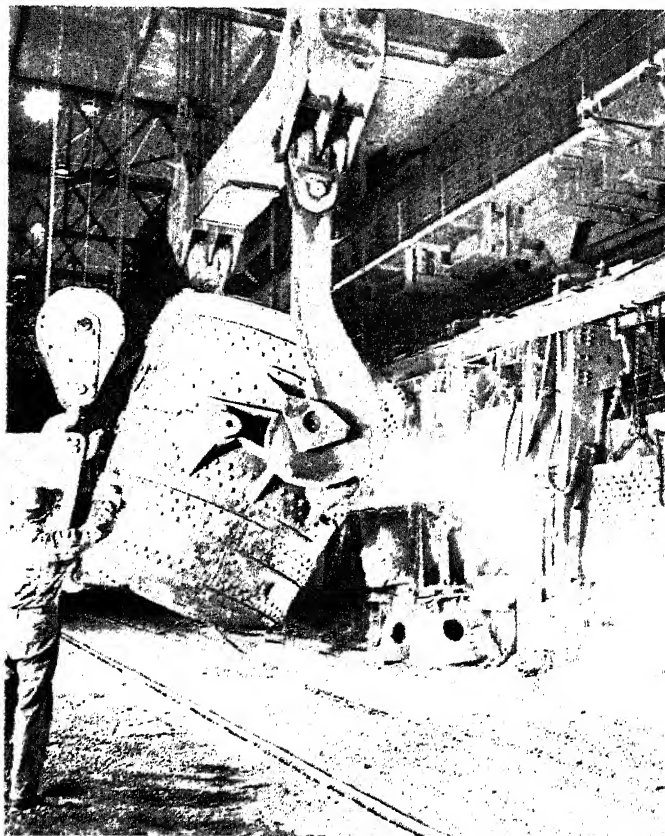
U.S. Plate 16. Other important industries are fishing, lumbering, and truck farming. The quantity of fish (left) caught for commercial purposes is between 4,000,000,000 and 5,000,000,000 lb. annually. Truck farms (below, left) produce the nation's supply of vegetables. A typical truck farm specializes in large-scale raising of a crop suitable to the soil and climate. Often located far from its markets, the farm is dependent on swift, modern rail and road carriers for crop shipment. Commercial forests, comprising about one fifth of the U.S. land area, have an annual yield (below, right) of about 37,000,000,000 bd.ft.



W. Bischof - Magnum



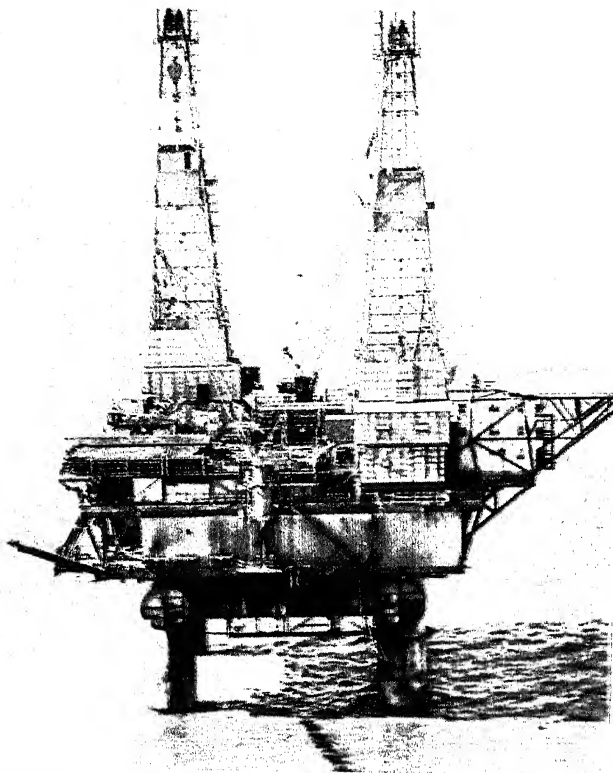
U.S. Plate 17. Two major American industries, steel and automobile production, are interrelated. Crude steel production in the U.S. averages about 120,000,000 tons a year and the annual automobile production in a recent year exceeded 8,500,000 units. Right: Molten iron is poured into an open-hearth furnace at one of the steel mills in Birmingham, Ala., for conversion into steel. Below: A two-door luxury sedan rolls off the assembly line at the Detroit, Mich., plant of the Chevrolet Motor Division of the General Motors Corporation.



Bureau of Publicity and Information, State of Alabama



General Motors, Chevrolet Motor Division

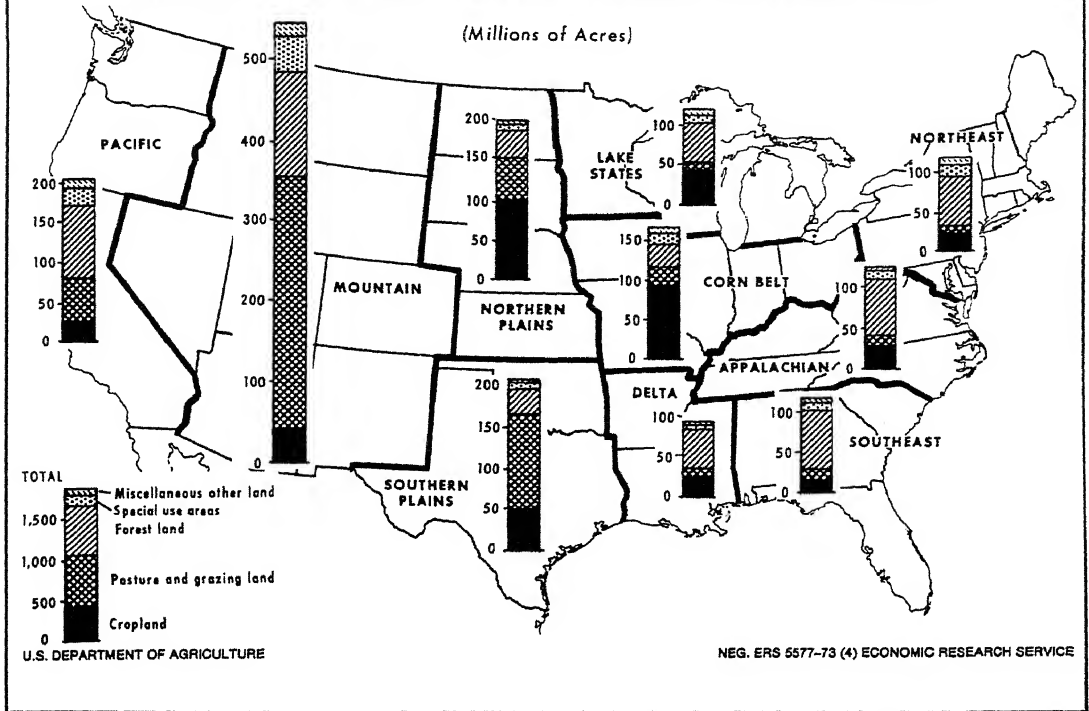


U.S. Plate 18. The massive energy needs of the U.S. are reflected in the vigorous search for new oil and gas deposits by many American oil companies, and the continued installation and development of extensive electric-power production and transmission systems. Left: The offshore drilling installation in Cook Inlet, near Anchorage, Alaska, is one of many to be found along the Pacific Ocean from southern California to the Arctic coast of northern Alaska. Below: The Bull Run steam plant near Oak Ridge, Tenn., is one of many electric-power installations operated by the Tennessee Valley Authority. An outstanding river-development project within the Mississippi River system, the T.V.A. provides more than 90,000,000,000 kw hours of electricity annually for an area of 80,000 sq.mi.

Alaska State Dept. of Economic Development

Tennessee Valley Authority



MAJOR USES OF ALL LAND, BY REGIONS, 48 STATES, 1969

about 4 percent of the population. Nonetheless, agriculture is still an important source of national income, and the U.S. is one of the most agriculturally productive countries of the world. During the 1970's the U.S. tended to lead in production of corn, soybeans, and meat, and was a major producer of raw cotton, wheat, milk, sugar, and potatoes. Economic conditions and weather influence crop plantings, productivity, and the farm-animal population.

Approximately 8,252,000 people lived on some 2,778,000 farms in the U.S. in 1976. Total acreage of farms was about 1,084,000,000, or an average of 390 acres per farm. In 1974 the value of farm land and buildings was approximately \$308,890,000,000, or an average of \$147,840 per farm. In 1976 cash receipts from the sale of crops were about \$47,937,000,000, and receipts from the marketing of livestock and livestock products amounted to about \$46,389,000,000. Government payments added another \$734,000,000 to gross farm income.

A comparison of the foregoing statistics with comparable figures for 1940 shows that the nature of American agriculture changed drastically over thirty-six years. The farm population of the

mid-1970's was about one third its size in 1940, despite the great increase in the total U.S. population. Farm acreage remained about the same over the period, but the number of farms decreased by more than one half. The average size of farms in the mid-1970's was more than twice that of 1940, and the average value was twenty-seven times greater. These changes represent elements of a revolution that has transformed agriculture since World War II. The development of mechanized, scientific farming has been primarily responsible for the revolution. High-powered machinery, the increased use of fertilizers and pesticides, and improved seeds have greatly increased the initial investment and operating costs of commercial farming. As a result, larger farms have become a financial necessity. At the same time, these innovations have contributed to a sharp rise in productivity per acre and per man. In 1940 it was estimated that one farmer could feed 10 persons; by 1950 average output had increased so that the ratio was one farmer to feed 15 persons, and by the 1970's the ratio was one farmer to feed more than 50 persons.

In 1974, according to a Federal census of agri-

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culture, about 61.5 percent of U.S. farms were owner-operated, 27.2 percent were operated by a farmer who shared ownership of his farm, and 11.3 percent were worked by tenants. A small proportion of U.S. farms were large-scale business operations, which were worked by hired labor under a salaried manager. According to the 1974 census of agriculture, about two thirds of all farms, which then numbered some 2,830,000, were commercial operations. About 39 percent of all farms had a gross income of over \$10,000 a year, and about 17 percent had gross sales receipts of \$40,000 or more.

The 1974 census of agriculture showed the following numerical distribution of farms by type of crop:

Type of Commercial Farm	Number of Farms
Cash-grain farms	580,000
Cotton farms	31,000
Tobacco farms	95,000
Other field-crop farms	81,000
Vegetable farms	20,000
Fruit and nut farms	51,000
Horticultural specialty farms	20,000
General crop farms	45,000
Livestock farms (other than dairy and poultry farms)	494,000
Dairy farms	196,000
Poultry and egg farms	43,000
Animal specialty farms	11,000
General livestock farms	15,000
Unclassified farms	13,000
Total of Commercial Farms	1,695,000

The official statistics for the chief cereal and other crops produced in the U.S. in 1976 are given in the accompanying table.

Vegetables and fruits are produced in large volume in the U.S. Some of the most important crops of this type, with 1976 production figures, are tomatoes, 7,546,400 tons; lettuce, 2,663,800 tons; sweet corn, 2,893,300 tons; apples, 6,231,000,000 lb.; oranges and tangerines, 247,800,000

boxes; grapefruit, 70,100,000 boxes; lemons, 17,800,000 boxes; pears, 827,000 tons; cherries, 237,000 tons; and grapes, 4,022,000 tons.

Cattle on American farms in 1976 totaled 127,976,000. Milk cows represented about 11,087,000 of this total. The remainder of the livestock population included about 55,085,000 hogs, 13,376,000 sheep and lambs, 3,037,000 turkeys, and 379,000,000 chickens. In the mid-1970's the U.S. produced about 39,608,000,000 lb. of meat, including about 25,969,000,000 lb. of beef and 12,415,000,000 lb. of pork. Production of fresh milk in 1976 was about 120,000,000,000 lb., and production of eggs about 65,000,000,000. About 114,000,000 lb. of shorn and pulled wool were produced in 1976.

See also AGRICULTURAL MACHINERY; AGRICULTURE: *Agriculture in the United States.*

Fishing and Forest Industries. The fishing industry was relatively more important during the colonial period than at any time since. Codfish was then the leading export of New England, and the towns of New Bedford, Nantucket, and New London became centers of a thriving whaling industry. Although British attacks on American vessels during the American Revolution and the Napoleonic period seriously damaged the fishing industry, it continued to be fairly important to the American economy before the Civil War. The main commercial fish, besides the whale, were codfish, mackerel, herring, halibut, and oysters. After the Civil War fisheries lagged behind the growth of many other industries, and by the middle of the 20th century less than 1 percent of the labor force was employed in the fishing industry. Nonetheless, the U.S. is one of the ranking fishing nations of the world. Immediately after World War II the U.S. led the world in production of fish, but by the mid-

ACREAGE, YIELD, AND PRODUCTION OF MAJOR CROPS

Crop	Acres Harvested (In Thousands)		Unit	Yield Per Harvested Acre		Production (In Thousands)	
	Average 1962-66	1976		Average 1962-66	1976	Average 1962-66	1976
Corn, grain	56,517	71,085	bu.	68.3	87.4	3,862,300	6,216,000
Wheat, all	47,677	70,824	bu.	25.8	30.3	1,229,893	2,147,000
Oats	19,957	12,392	bu.	45.7	45.4	911,628	562,000
Barley	10,615	8,417	bu.	37.8	44.8	398,417	377,284
Flaxseed	2,831	954	bu.	10.4	7.7	29,293	7,356
Sorghum grain	12,496	14,877	bu.	47.4	48.6	594,633	723,679
Rice	1,818	2,501	cwt.	40.7	46.79	74,156	117,019
Cotton lint	13,401	10,914	lb.	500	465	6,825,540	5,086,000
Hay, all	66,838	60,915	ton	1.81	1.98	120,927	121,000
Beans, dry edible	1,428	1,485	lb.	1,286	1,159	1,834,000	1,721,600
Soybeans for beans	31,602	49,443	bu.	24.3	25.6	768,672	1,265,000
Peanuts	1,409	1,521	lb.	1,496	2,465	2,110,983	3,750,890
Potatoes	1,358	1,374	cwt.	202	257	275,023	353,366
Sweet potatoes	170	118	cwt.	87	116	14,733	18,703
Tobacco	1,086	1,044	lb.	1,957	2,044	2,125,580	2,134,184
Sugarcane	603	760	ton	39.0	37.9	23,471	28,790
Sugar beets	1,228	1,481	ton	17.3	19.9	21,245	29,427

1970's it had fallen to fifth place, ranking behind, in descending order, Japan, the Soviet Union, China, and Peru.

The quantity of fish caught for commercial purposes by U.S. fisheries in the mid-1970's was between about 4,858,000,000 and 5,350,000,000 lb. annually. The catch varies somewhat from year to year. In one year in the mid-1970's fisheries of the Gulf States led all other sections of the country, with a catch of about 1,663,000,000 lb., valued at \$271,000,000. The Pacific coast States, including Alaska, were next, with about 1,521,000,000 lb., valued at \$359,000,000. Production in the Chesapeake Bay States was about 508,000,000 lb., valued at \$54,000,000; in the New England States, 497,000,000 lb., valued at \$150,000,000; in the South Atlantic States, 327,000,000 lb., valued at \$61,000,000; and in the Middle Atlantic States, 188,000,000 lb., valued at \$50,000,000.

Among the chief catches in the mid-1970's, by approximate annual volume, were menhaden, 1,803,000,000 lb.; shrimp, 344,000,000 lb.; tuna, 391,000,000 lb.; Pacific salmon, 202,000,000 lb.; crabs, 301,000,000 lb.; and flounder, 156,000,000 lb. The value of the annual total U.S. catch (at pierside) was about \$971,000,000 in the mid-1970's. The U.S. fishing fleet, excluding craft with a deadweight capacity of less than 5 tons, numbered about 16,000 vessels. See also FISHERIES.

During the period of American settlement much of the virgin forest land was cleared, particularly in the E. part of the country. Large amounts of timber, including the more valuable hardwoods, were burned. Today most of the trees in the commercial forests, covering some 500,000,000 acres and comprising about one fifth of the U.S. land area, are second growth and are inferior in quality to virgin timber. In the mid-1970's the timber cut of the U.S. yielded about 32,614,000,000 bd.ft. of lumber annually. Of this total, about 80 percent consisted of softwoods, chiefly Douglas fir, yellow pine, ponderosa pine, white fir, and hemlock. The remainder consisted mainly of such hardwoods as oak, yellow poplar, red gum, tupelo, maple, beech, cottonwood, and ash. Oregon leads the nation in lumber production. Other important lumber-producing States are California, Washington, Louisiana, Alabama, Georgia, North Carolina, Mississippi, Texas, Arkansas, and Virginia. The annual timber cut of the U.S. also regularly yields a vast volume of pulpwood. Turpentine and rosin are produced in large quantities, especially from the forests of Georgia, Florida, Alabama, and Mississippi. See also FORESTRY.

Mining. The American colonists were largely unaware of the mineral wealth of the country,

although coal and iron were mined and used on a limited scale from the beginning of settlement. Mining began to figure importantly in U.S. history when gold was discovered in California in 1848. This, and the subsequent discoveries of gold in Utah in 1858 and in Colorado in 1859, played an important role in the early development of the Far West. A few years later the industrial revolution gave importance to many nonprecious metals found in the Mountain States, where mining became an important industry. In the mid-1970's the U.S. ranked first among the countries of the world in the annual production of copper, lead, molybdenum, natural gas, phosphate rock, salt, sulfur, and uranium. The U.S. also was a leading producer of coal, gold, iron ore, crude petroleum (see PETROLEUM: *The Petroleum Industry*), potash, and silver. The yearly U.S. output in the mid-1970's of selected minerals is shown in the following:

Mineral	Production
Bauxite	1,772,000 long tons
Copper	1,413,000 short tons
Gold	1,052,000 troy oz.
Iron ore	75,700,000 long tons
Lead	621,000 short tons
Molybdenum	105,000,000 lb.
Silver	34,900,000 troy oz.
Vanadium	4,743 short tons
Zinc	469,000 short tons
Coal	654,000,000 short tons
Crude petroleum	3,057,000,000 bbl.
Natural gas	20,109,000,000 cu.ft.
Phosphate rock	48,800,000 short tons
Sulfur	5,077,000 long tons

In 1975 the total value of minerals produced in the U.S. rose to a record \$62,300,000,000, almost 50 percent higher than in 1972 largely because of the increase in the value of fuels. Petroleum, natural gas, and coal accounted for \$47,600,000,000 of total value; other high-value minerals were stone and cement.

Currency and Banking. Under provisions of the U.S. Constitution, the Congress was given power to coin money and to regulate its value. Acting on proposals of Secretary of the Treasury Alexander Hamilton, its members passed the Mint Act of 1792, which established the dollar as the basic unit of value; adopted the decimal system of reckoning; and authorized the minting of both gold and silver coins, with gold to be valued at fifteen times more than silver (a mint ratio that later underwent adjustments). Gold coins were issued in denominations of \$10.00 (an eagle), \$5.00, and \$2.50, and silver coins in denominations of \$1.00, \$0.50, and \$0.25 (quarter). Later the dime (\$0.10) and nickel (\$0.05) were added. Copper pennies and half-pennies were circulated from the first. Gold coins are no longer circulated, but the silver dollar and the

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half dollar, quarter, dime, nickel, and penny are in current use.

The first major change in coinage in three decades occurred in 1965, when silver was eliminated from the dime and quarter and substantially reduced in the half dollar. *See also* DOLLAR: *United States Dollar*; MONEY: *The Monetary System of the United States*.

The banking system of the U.S. is currently regulated in accordance with the Federal Reserve Act of 1913. Under this act, twelve regional Federal Reserve Banks were established to function as bankers' banks, and a Federal Reserve Board was created to coordinate the system nationally. All national banks were compelled by law to become members of the Federal Reserve System, and State commercial banks were allowed to do so.

One of the major purposes of the system was to provide an elastic supply of currency, and to this end, a Federal Reserve agent at each of the regional banks was empowered to issue Federal Reserve notes, which the Federal Reserve Bank could pay out to its members. Under the original law, all notes that were issued were backed by deposits of gold representing at least 40 percent of their value. As backing for the remainder of their value, U.S. government securities and certain types of commercial paper were deposited with the Federal Reserve agent, who held this collateral until the notes were redeemed. Over the years since the law was written, the backing for Federal Reserve notes has been altered several times. In contrast to other types of currency, Federal Reserve notes constitute a type of money that may be easily expanded or contracted, because the notes are paid out mainly for commercial paper, which represents business demands for money and credit. Over the years, a larger and larger proportion of U.S. currency has taken the form of Federal Reserve notes. In the mid-1970's such notes exceeded 98 percent of the paper currency in circulation.

During the worldwide depression of the early 1930's, the U.S., along with many other countries, demonetized gold on a domestic basis and devalued its currency. These steps were taken as a reaction to a worldwide run on gold and in an effort to raise prices domestically while making U.S. goods cheaper for foreign customers. To this end the U.S. government stopped all exports of gold in 1933 and also made it illegal for U.S. citizens to hoard gold and gold certificates. By the Gold Reserve Act of 1934 the government devalued U.S. currency by about 41 percent and raised the price of an ounce of gold from \$20.67 to \$35.00; in 1972

gold was revalued to \$38.00, then to \$42.22 an ounce. In 1975 U.S. citizens could own gold.

Besides monetary reforms, the depression brought a number of banking reforms, including the establishment of the Federal Deposit Insurance Corporation (q.v.), which insured all bank deposits up to a limit of \$5000. The limit has been raised several times; currently, the first \$40,000 of individual bank deposits is insured.

Throughout the depression and World War II and in many of the postwar years, the government operated at a deficit. Much of the huge government debt built during this time is now in the form of bonds held by banks in the Federal Reserve System and by other financial institutions.

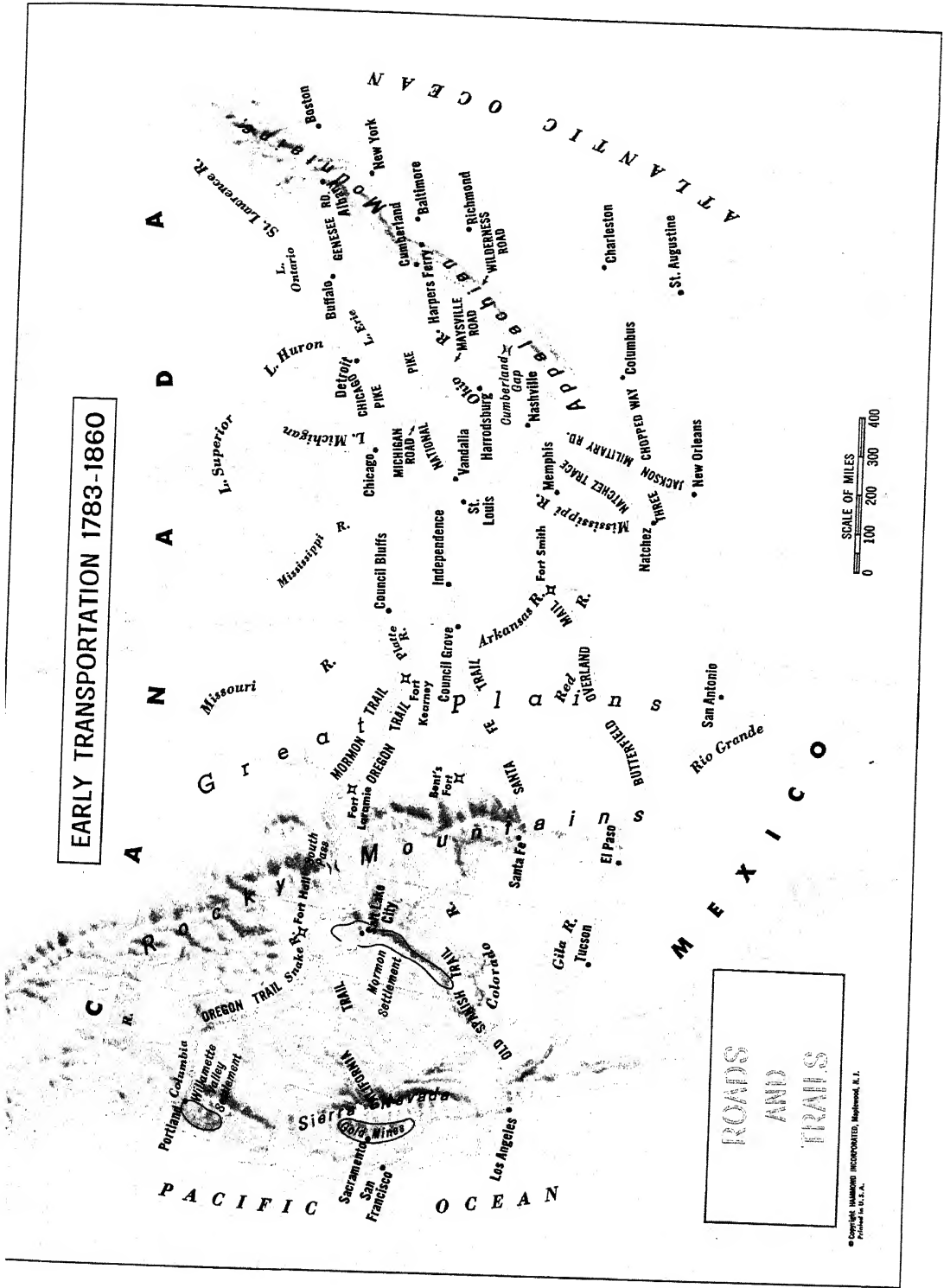
See BANKS AND BANKING: *The United States Banking System*.

Commerce and Trade. Before the American Revolution, when the colonies that became the U.S. belonged to England, they were expected to benefit the economy of the mother country by serving as a source of raw materials and as an outlet for English manufactures. The economies of the southern colonies complemented that of England, to which the South exported tobacco, rice, indigo (dye), and naval stores, and from which the South imported such manufactured items as hardware, dry goods, and furniture. The economies of the northern colonies, yielding such staples as fish, grain, meat, and lumber, were competitive with England's economy. They could not sell enough to England to pay for the finished goods they imported from the mother country. Instead, England took their products to the British West Indies and traded them for fruit, sugar, and molasses.

After the Revolution, the rapid geographic and demographic expansion of the U.S. continually gave access to new resources and created new markets that could be exploited to the advantage of the States on the E. seaboard. Thus, from the beginning of the nation, the U.S. economy was oriented more toward internal development and commerce than toward foreign commerce.

DOMESTIC COMMERCE. The pattern of domestic trade throughout most of U.S. history involved the movement of manufactures and capital from the eastern U.S. to the western and the movement of agricultural and other primary products from west to east. The expansion of commerce received considerable impetus from improvements in transportation and from the industrial revolution of the latter half of the 19th century. In the 20th century, domestic commerce has been considerably affected by the

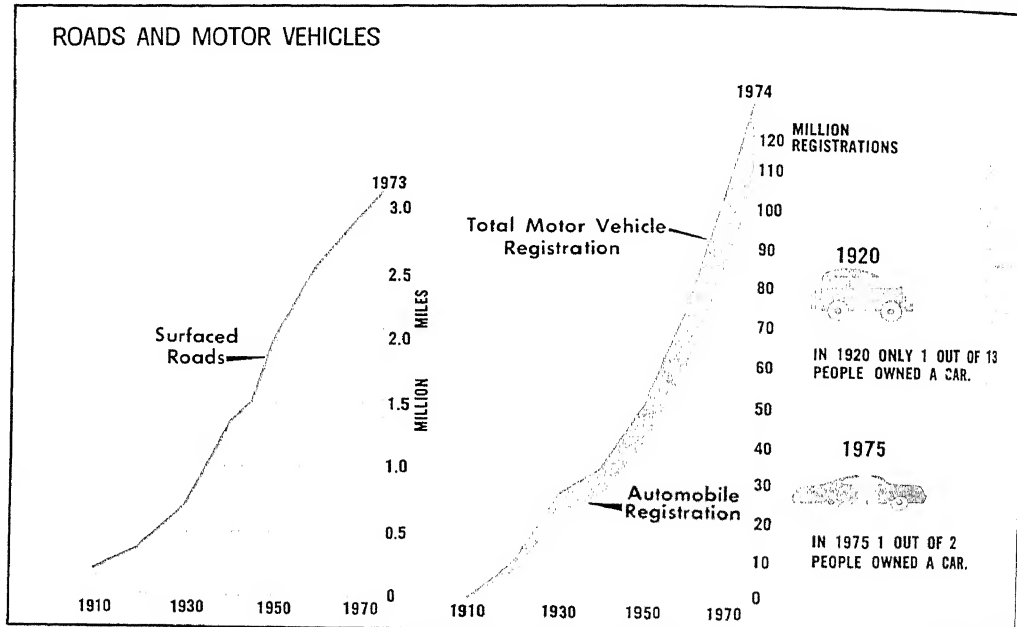
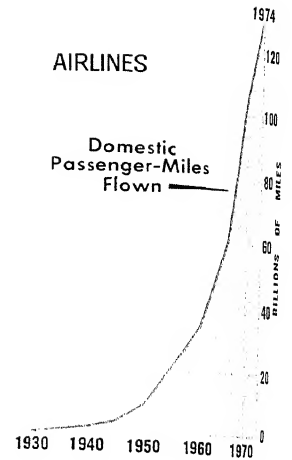
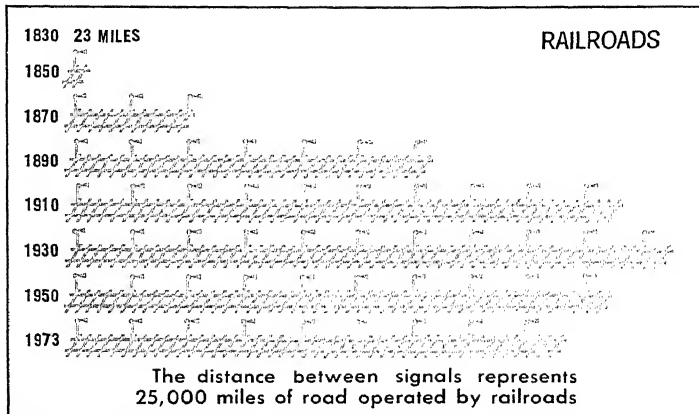
EARLY TRANSPORTATION 1783-1860



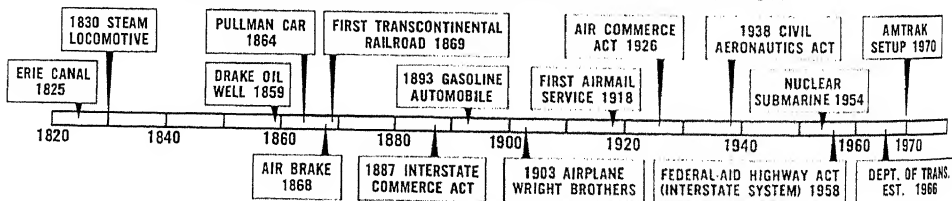
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GROWTH OF UNITED STATES ECONOMY

TRANSPORTATION



MAJOR EVENTS IN THE GROWTH OF TRANSPORTATION



automobile and the trend to urbanization. Chain stores, discount houses, and suburban shopping centers are characteristic of merchandising in the latter half of the 20th century. In the mid-1960's, wholesale establishments numbered about 311,000, with annual sales of about \$459,000,000,000. Of these establishments, some 213,000 were merchant wholesalers with sales of \$206,000,000,000. Wholesale sales figures reached \$365,000,000,000 in 1973. The number of retail trade establishments was about 2,000,000 in the mid-1960's. About 17 percent of the establishments were eating and drinking places and nearly 15 percent were grocery and other food stores. The third-largest category was gasoline service stations, which accounted for about 10 percent. The combined sales of all retail establishments was about \$310,000,000,000. By 1973, total retail sales had reached \$503,300,000,000; automobiles and products ranked first, food second, and general merchandise third in value of sales. *See also* RETAILING.

FOREIGN COMMERCE. In the years following the American Revolution, the outbreak of war between France and Great Britain disrupted the trade and shipping of these two countries and gave U.S. shipowners and merchants an opportunity to open avenues of trade with northern Europe, Latin America, the West Indies, and the Far East. After peace was restored, U.S. trade expanded considerably between about 1820 and the Civil War. During this period most of the U.S. imports were manufactured goods from Great Britain and Europe, particularly textiles and metal products, and such commodities as sugar, coffee, and furs and hides from the Western Hemisphere. By far the leading U.S. export was cotton, followed by wheat and flour, tobacco, and lumber and wood manufactures. The most important trading partners were Great Britain, France, Cuba, British North America (Canada), Germany, Brazil, and China.

After the Civil War the character of U.S. foreign trade began to change. Gradually exports began to include a larger proportion of manufactured goods, and imports to include comparatively more raw materials. This trend has continued over the past century. In 1860 only about one tenth of U.S. exports were finished manufactures, but in the mid-1970's over half were finished manufactures. Only one tenth of imports in 1860 were crude materials for use in manufacturing, but one third of all imports in the mid-1970's were crude materials and crude foodstuffs. Changes in the nature of U.S. exports and imports led to some shifts of trading partners. In 1860 Europe supplied the U.S. with most

of its imports and bought most of its exports. Although Western European countries have always remained important customers and suppliers, they accounted collectively for only about one third of all U.S. trade in the early 1970's. The most important U.S. trading partners in the early 1970's were Canada, Japan, Great Britain, Germany, the Netherlands, Mexico, and France. The leading U.S. exports, by value, include chemicals, aircraft and parts, automotive parts, passenger cars, business machines, power-generating and other machinery, grains, soybeans, coal, and communications equipment. The leading imports are petroleum and products, automobiles, iron and steel products, chemicals, nonferrous metals, communications equipment, textiles and clothing, meat and fish, coffee, newsprint, footwear, alcoholic beverages, sugar, and motorcycles. The total value of exports in 1973-74 was estimated at about \$84,928,000,000 and of imports, about \$85,462,000,000.

Balance of Payments. Until the 1870's, the U.S. imported goods of greater value than the worth of its exports, but from 1874 the U.S. began to have an export surplus, or, as it is called, a favorable balance of trade. Until World War I, however, the U.S. remained a debtor nation; that is, foreign countries had more invested in the U.S. than the U.S. had invested in foreign countries. During World War I the nations of Europe imported heavily from the U.S. To pay for their imports, they began to liquidate their U.S. investments, and they also obtained American loans. Since that time the U.S. has been a creditor nation. In 1973, for example, the value of U.S. foreign assets and investments totaled more than \$226,100,000,000, whereas the value of foreign assets and investments in the U.S. was \$163,100,000,000. *See also* FOREIGN TRADE.

Transportation. The development of transportation facilities was of crucial importance in the growth of the U.S. The first routes of travel were natural waterways; the earliest overland routes were rough trails suitable for travel on foot or horseback. No surfaced roads existed until the 1790's, when the first turnpikes were built, some under private auspices and some by State governments. Besides the overland roads, many canals were constructed between the late 1700's and 1850 to link navigable rivers and lakes in the eastern U.S. and in the Great Lakes region. Steam railroads began to appear in the East in the 1820's. The first transcontinental railroad was constructed between 1862 and 1869 by the Union Pacific and Central Pacific companies, both of which received large subsidies from the

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Federal government. Transcontinental railroads were the chief means of transportation used by settlers who populated the West in the latter part of the 19th century and were also of utmost importance for moving raw materials and marketing goods from one part of the country to another. The railroads continued to expand until 1917, when track mileage reached a peak of 253,000. Thereafter, motor transport became a serious competitor of the railroads both for passengers and freight.

Air transport began to compete with other modes of transport in the U.S. after World War I. The first commercial flights in the U.S. were made in 1918 and carried mail. Passenger service began to gain importance in the late 1920's, but not until after World War II did air transport become a dominant mode of travel.

RAILROADS. In the early 1970's the main-track mileage owned by U.S. railroads totaled about 204,000. The trains annually carried about 267,300,000 passengers, who traveled a total of about 8,649,300,000 mi. Of the total passenger miles, about 4,323,300,000 represented commutation trips, about 3,830,000,000 were traveled by coach passengers, and about 496,000,000 by parlor and sleeping-car passengers. The freight tonnage carried by railroads totaled about 1,500,000,000 annually. In the early 1970's the number of locomotives in service was about 29,300, most of which were diesel. The average number of persons employed at any time during the year was 582,000. *See RAILROADS: United States Railroads.*

MOTOR TRANSPORT. Road mileage in the U.S. in the early 1970's was about 4,000,000, of which all but about 800,000 mi. were surfaced. The number of motor vehicles registered in 1971 was about 112,000,000, including about 92,000,000 passenger cars and taxis and about 20,000,000 trucks and buses. It was estimated that some 83 percent of all U.S. families owned at least one automobile and that about 80 percent of all intercity travel was in private automobiles. About 3 percent of the total volume of intercity passenger traffic was handled by motorbus companies in the early 1970's. Such companies numbered about 1000; they operated some 23,000 buses, which served about 268,000 mi. of highway and carried about 398,000,000 passengers annually. Of greater importance than bus services are trucking services. Trucking companies providing intercity service numbered about 1300 and handled a total freight traffic of about 560,000,000 ton miles.

AIRLINES. In the early 1970's about 35 U.S. airlines provided service over some 131,000 mi. of do-

mestic air routes, and about 5 U.S. airlines operated over some 175,000 mi. of international routes. These airlines carried about 156,000,000 passengers annually on domestic flights and 18,000,000 on international flights and flew a total of about 2,000,000,000 mi. The number of airports throughout the country (including Alaska and Hawaii) in the early 1970's was about 12,000, of which 4500 were public facilities and 7500 were private. Aircraft used on service flights numbered 2400. *See also AIR TRANSPORT, MARINE SHIPPING.* In the early 1970's the Merchant Marine of the U.S. comprised some 1500 vessels of 1000 gross tons or over, including about 170 combination passenger and cargo ships, about 1200 cargo ships, and 300 tankers. Of these vessels about 555 were active, and of these, about 320 were engaged in foreign trade and 235 in domestic trade. In the early 1970's waterborne cargo totaled about 950,000,000 short tons annually between domestic ports and 540,000,000 short tons between foreign ports, of which 5.6 percent was carried by U.S.-flag vessels.

See also MERCHANT MARINE OF THE UNITED STATES.
Communications. Until 1704, when the first newspaper was established, communication in the American colonies was by word of mouth or by private letter, the delivery of which was haphazard until the first organized mail service was established in 1691. Mail service was left to private enterprise until 1707, when the British Parliament passed a law to establish an imperial postal service in its American colonies. During the American Revolution the Continental Congress established a post office, which was given permanent status by laws passed in the 1790's. A major advance in methods of communication was the telegraph, which came into use to link important cities of the country between 1843 and 1860. Telegraphic communication was established between the U.S. and Europe in 1866 when a transatlantic cable was laid. Telephone service began to spread in the U.S. in the last two decades of the 19th century, and radio became popular in the 1920's. The most recent important development was television, which became a major industry in the late 1940's.

MAIL SERVICE. Mail service in the U.S. during the early 1970's was handled through more than 32,000 post offices. The number of post offices in 1970 was less than half as many as existed in 1900, yet the volume of mail had increased more than elevenfold. The annual volume of mail handled by the U.S. postal service in 1970 amounted to some 85,000,000,000 pieces, or more than 400 pieces for every man, woman,

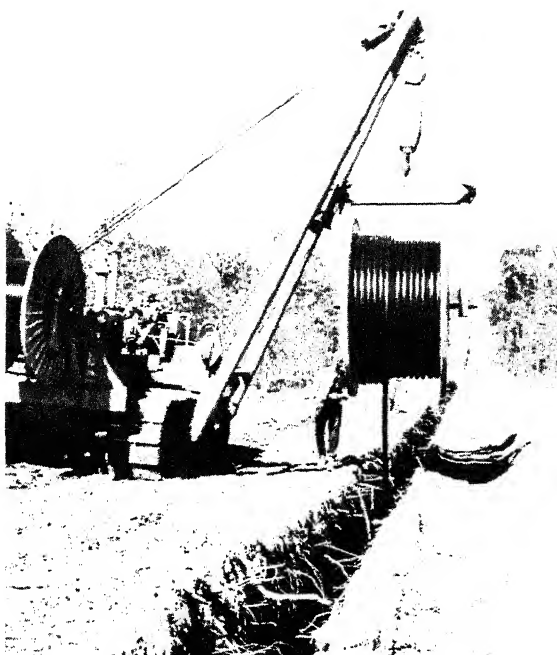
and child in the country. Of this total, airmail and first-class mail represented about 62 percent. See also POSTAL SERVICE, UNITED STATES.

TELEPHONE AND TELEGRAPH. In 1972 the U.S. had more than 131,000,000 installed telephones, of which about 73 percent were residential and about 27 percent were business phones. In 1972 the number of daily phone calls was about 576,000,000, of which about 37,000,000 were long-distance calls. The number of households in the U.S. with telephones constantly increases. It has grown from 37 percent in 1940 to about 93 percent in the mid-1970's. During the same period, the use of the telegraph has decreased from 192,000,000 messages in 1940 to about 40,000,000 in the mid-1970's. See also TELEGRAPH; TELEPHONE.

RADIO AND TELEVISION. The number of commercial broadcasting stations in operation in the early 1970's was more than 7700—about 700 television stations, 4400 AM radio stations, and 2600 FM radio stations. Texas and California led all the States in number of television stations and radio stations. About 96 percent of all households had a television set, compared with 88 percent in 1960 and 67 percent in 1955. The number of radio sets in use was about 268,000,000, of which about 73,000,000 were automobile radios.

PUBLICATIONS. In 1973 the U.S. had about 1775 daily newspapers with a total paid circulation of more than 63,000,000, and about 634 Sunday papers with a paid circulation of about 52,000,000. The number of books published in 1973 was about 40,000, including 28,000 books published for the first time and 12,000 new editions of previously published works. Juvenile books, fiction, and books in the fields of sociology and economics, science, and religion were the most popular types. See also BOOK TRADE; NEWSPAPERS: *United States Newspapers*.

Labor. In 1974 the civilian labor force totaled about 93,800,000, including about 57,400,000 males and about 36,400,000 females. The percentage of unemployed averaged about 6.2. Of the white employed population in 1974, about 43 percent were white-collar workers, including professional and technical workers (15 percent), managerial personnel (15 percent), clerical workers (6 percent), and sales personnel (7 percent); 46 percent were blue-collar workers, including craftsmen and foremen (22 percent), operatives (18 percent), and other nonfarm laborers (6 percent); 7 percent were service workers; 3 percent were farmers and farm managers; and 2 percent were farm laborers. Of the nonwhite employed population, about 24 percent were white-collar workers, including pro-



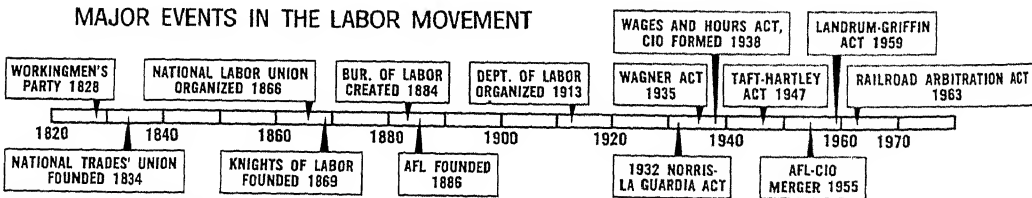
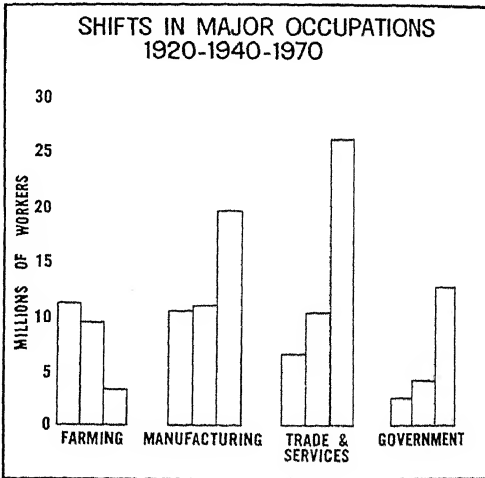
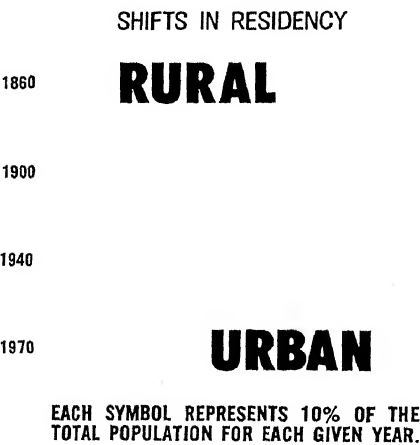
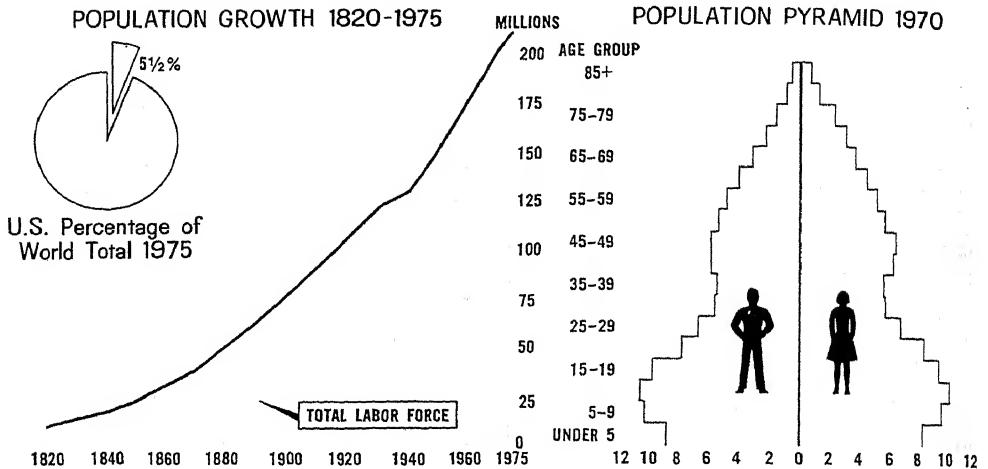
Cable is laid for another long-distance telephone route. Phones have become an indispensable part of business; their residential use (over 90 percent of all U.S. households) continues also to increase. A.T.&T.

fessional and technical workers (9 percent), managerial personnel (5 percent), clerical workers (8 percent), and sales personnel (2 percent); 56 percent were blue-collar workers, including craftsmen and foremen (16 percent), operatives (36 percent), and other nonfarm laborers (15 percent); 15 percent were service workers; 1 percent were farmers and farm managers; and 3 percent were farm laborers. The average output per man-hour rose by over 55 percent between 1955 and 1974; hourly compensation during the same period rose by about 66 percent, but only about 24 percent of the increase represented a rise in real income. Median yearly earnings for male workers (female in parentheses) in 1972 were about \$7610 (\$3649). Median earnings for professional and technical workers were \$10,735 (\$6034); for managerial personnel, \$11,277 (\$5495); for clerical workers, \$7265 (\$4232); for sales personnel, \$8451 (\$2338); for craftsmen and foremen, \$8172 (\$5408); for operatives and kindred workers, \$6730 (\$3635); for service workers (except domestic help), \$5100 (\$2320); for farmers and farm managers, \$4822 (\$2277); for farm laborers, \$2570 (\$1087); and for other laborers, \$4617 (\$2988).

Between August, 1974, and April, 1975, however, unemployment rose sharply in the U.S., as in other countries. More than 8,000,000 persons were unemployed by the middle of 1975, and the rate of unemployment ranged from 10

GROWTH OF UNITED STATES ECONOMY

POPULATION AND LABOR FORCE



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Sources: Historical Statistics of the United States
Statistical Abstract of the United States

percent to more than 18 percent in some heavily industrialized cities.

In the early 1970's the U.S. had about 177 national and international unions with a combined annual membership of about 21,000,000. See **TRADE UNIONS IN THE UNITED STATES**.

GOVERNMENT

For information regarding the various government departments and many of the major agencies, see separate articles on individual departments and agencies. For the major branches of government, see **CONGRESS OF THE UNITED STATES**; **PRESIDENT OF THE UNITED STATES**; **SUPREME COURT OF THE UNITED STATES**.

The basic law of the land is the Constitution of the United States, as amended. Under its provisions, the U.S. is governed as a Federal republic, which, at present, consists of 50 States, each with its own constitution and government and a considerable measure of internal autonomy. Powers granted to the national government by the Constitution include control over foreign relations, foreign and interstate commerce, currency and coinage, standardization of weights and measures, bankruptcy, patents and copyrights, postal service, national defense and military forces, Federal crimes, and territorial possessions. The Federal government also is granted the authority to borrow on the credit of the nation, to levy taxes, and to "provide for the common defense and general welfare . . .".

These powers are exercised by three separate branches of government: legislative, executive, and judicial. Within these branches of government, the will of the people is represented by the legislative branch, in which all the legislative posts are elective, and by the nationally elected President and Vice-President, who are the only elected officials in the executive branch. The Federal judicial branch has no elected officials. The right to vote in both national and local elections is determined by the laws of the separate States; however, U.S. Constitutional amendments and Federal statutes specifically forbid disqualification of voters in any State because of race, color, or sex. Before 1971 the minimum age for voting ranged from eighteen to twenty-one; in 1971 the Twenty-Sixth Amendment to the Constitution was ratified, making eighteen the minimum voting age in all elections. In many States literacy is a qualification. See also **ELECTIONS**; **ELECTORAL COLLEGE**. **Legislative Branch.** The lawmaking body of the government is the Congress of the United States, which is made up of an upper house, called the Senate; and a lower house, called the House of Representatives. A new Congress takes

office every two years following elections for a new House of Representatives and for a third of the membership of the Senate. The first regular session of the Congress normally begins on the January 3 following Congressional elections in November and lasts until Congress is adjourned, usually early in the summer. The second regular session of the Congress begins on January 3 of the following year. When it ends, the Representatives and those Senators whose terms are due to expire may return to their home States to campaign for reelection. Although the Senate and House sometimes meet in joint session, they operate as separate bodies in proposing, debating, amending, and voting on legislation. No law may be enacted until it has received majority votes in both houses, and if the President vetoes a bill, a two-thirds vote of approval in both Houses is required to override the Presidential veto. While sharing in common the responsibility of lawmaking, the two Houses of Congress differ in structure, and each house has special and distinct responsibilities.

SENATE. The Senate was constituted to represent the States as separate political entities. Regardless of its area and population, each State is entitled to send two members to the Senate, which has a total of 100 members when all its seats are filled. Senators, who serve six-year terms, were once elected by State legislatures but now are elected directly by the voting population of the States they represent. To ensure the continuity of the Senate, the terms of the Senators are staggered so that one third of the total membership is elected every two years.

In addition to its legislative duties, the Senate has responsibility for ratifying or withholding confirmation of treaties made by the President with foreign powers and for confirming Presidential appointments of cabinet members, Federal judges, ambassadors, and other major Federal officials.

HOUSE OF REPRESENTATIVES. The House of Representatives is constituted to represent the population on a per capita basis, and its members are elected by voters in Congressional Districts, which are designed to be defined so that each district represents about the same number of citizens. Since 1912 the total membership in the House has been set officially at 435. Seats in the House are apportioned among the States on the basis of population at the last decennial census. According to the 1970 census, by which the last apportionment was made, the ratio of the total U.S. population to the number of Representatives was about 477,900 to every Representative. At the time of the 1970 census, the States of Ver-

PRESIDENTIAL ELECTION RETURNS FROM 1789 TO THE PRESENT*

(F) Federalist, (D) Democratic, (R) Republican, (DR) Democratic-Republican; (IR) Independent-Republican, (NR) National Republican, (W) Whig, (P) People's, (Pr) Progressive, (S) Socialist, (SR) States' Rights, (A) American; (AI) American Independent

Year	President Elect	Popular Vote	Electoral Vote	Defeated Candidate(s)	Popular Vote	Electoral Vote
1789	George Washington (No party)	Unknown	69	No opponent ¹		
1792	George Washington (F)	Unknown	132	No opponent ¹		
1796	John Adams (F)	Unknown	71	Thomas Jefferson (DR) ¹		68
1800	Thomas Jefferson (DR)	Unknown	73	Aaron Burr (DR) ¹		73
				John Adams (F)		65
1804	Thomas Jefferson (DR)	Unknown	162	Charles Pinckney (F)		14
1808	James Madison (DR)	Unknown	122	Charles Pinckney (F)		47
1812	James Madison (DR)	Unknown	128	De Witt Clinton (F)		34
1816	James Monroe (DR)	Unknown	183	Rufus King (F)		1
1820	James Monroe (DR)	Unknown	231	John Quincy Adams (IR)		99
1824	John Quincy Adams (NR) ²	108,740	84	Andrew Jackson (D)	153,544	37
				Henry Clay (DR)	47,136	37
				William H. Crawford (DR)	46,618	41
1828	Andrew Jackson (D)	647,286	178	John Quincy Adams (NR)	508,064	83
1832	Andrew Jackson (D)	687,502	219	Henry Clay (NR)	530,189	49
1836	Martin Van Buren (D)	765,483	170	William H. Harrison (W)	739,795 ³	73
				Hugh L. White (W)		26
1840	William H. Harrison (W)	1,274,624	234	Daniel Webster (W)	1,127,781	60
1844	James K. Polk (D)	1,338,464	170	Martin Van Buren (D)	1,300,097	105
				Henry Clay (W)		
1848	Zachary Taylor (W)	1,360,967	163	Lewis Cass (D)	1,222,342	127
1852	Franklin Pierce (D)	1,601,117	254	Winfield Scott (W)	1,385,453	42
1856	James C. Buchanan (D)	1,832,955	174	John C. Frémont (R)	1,339,932	114
				Millard Fillmore (A)	871,731	8
1860	Abraham Lincoln (R)	1,865,593	180	Stephen A. Douglas (D)	1,382,713	12
				John C. Breckinridge (D)	848,366	72
1864	Abraham Lincoln (R)	2,206,938	212	George B. McClellan (D)	1,803,787	21
1868	Ulysses S. Grant (R)	3,013,421	214	Horatio Seymour (D)	2,706,829	80
1872	Ulysses S. Grant (R)	3,596,745	286	Horace Greeley (D) [died Nov. 29, 1872]	2,843,446	
1876	Rutherford B. Hayes (R) ⁴	4,036,572	185	Samuel J. Tilden (D)	4,284,020	184
1880	James A. Garfield (R)	4,453,295	214	Winfield S. Hancock (D)	4,414,082	155
1884	Grover Cleveland (D)	4,879,507	219	James G. Blaine (R)	4,850,293	182

PRESIDENTIAL ELECTION RETURNS FROM 1789 TO THE PRESENT* (Continued)

1888	Benjamin Harrison (R)	5,447,129	233	Grover Cleveland (D)	5,537,857	168
1892	Grover Cleveland (D)	5,555,426	277	Benjamin Harrison (R)	5,182,690	145
				James Weaver (P)	1,029,846	22
1896	William McKinley (R)	7,102,246	271	William J. Bryan (D)	6,492,559	176
1900	William McKinley (R)	7,218,491	292	William J. Bryan (D)	6,356,734	155
1904	Theodore Roosevelt (R)	7,628,461	336	Alton B. Parker (D)	5,084,223	140
1908	William H. Taft (R)	7,675,320	321	William J. Bryan (D)	6,412,294	162
1912	Woodrow Wilson (D)	6,296,547	435	Theodore Roosevelt (Pr)	4,118,571	88
				William H. Taft (R)	3,486,720	8
1916	Woodrow Wilson (D)	9,127,695	277	Charles E. Hughes (R)	8,533,607	254
1920	Warren G. Harding (R)	16,143,407	404	James M. Cox (D)	9,130,326	127
				Eugene V. Debs (S)	919,799	0
1924	Calvin Coolidge (R)	15,718,211	382	John W. Davis (D)	8,385,283	136
				Robert M. La Follette (Pr)	4,831,289	13
1928	Herbert Hoover (R)	21,391,993	444	Alfred E. Smith (D)	15,016,169	87
1932	Franklin D. Roosevelt (D)	22,809,638	472	Herbert Hoover (R)	15,758,901	59
1936	Franklin D. Roosevelt (D)	27,752,869	523	Alfred Landon (R)	16,674,665	8
1940	Franklin D. Roosevelt (D)	27,307,819	449	Wendell L. Willkie (R)	22,321,018	82
1944	Franklin D. Roosevelt (D)	25,606,585	432	Thomas E. Dewey (R)	22,014,745	99
1948	Harry S. Truman (D)	24,179,345	303	Thomas E. Dewey (R)	21,991,291	185
				J. Strom Thurmond (SR)	1,176,125	39
				Henry A. Wallace (Pr)	1,157,326	0
1952	Dwight D. Eisenhower (R)	33,936,234	442	Adlai E. Stevenson (D)	27,314,992	89
1956	Dwight D. Eisenhower (R)	35,590,472	457	Adlai E. Stevenson (D)	26,022,752	73 ⁵
1960	John F. Kennedy (D)	34,226,731	302 ⁶	Richard M. Nixon (R)	34,108,157	219
1964	Lyndon B. Johnson (D)	43,129,566	486	Barry Goldwater (R)	27,178,188	62
1968	Richard M. Nixon (R)	31,785,480	301	Hubert H. Humphrey (D)	31,275,166	191
				George C. Wallace (AI)	9,906,473	46
1972	Richard M. Nixon (R)	47,170,179	520 ⁷	George S. McGovern (D)	29,171,791	17
				John J. Schmitz (AI)	1,090,673	0
1976	(James Earl) Jimmy Carter (Jr.) (D)	41,426,405	297	Gerald R. Ford (R)	39,147,402	240 ⁸
				Eugene J. McCarthy (Independent)	749,400	0

* Presidents not listed are John Tyler (1841-45), Millard Fillmore (1850-53), Andrew Johnson (1865-69), Chester Arthur (1881-85), and Gerald R. Ford (1974-77), who attained the Presidency through the death or, in the case of Ford, the resignation of their predecessor and were never elected to the office. Theodore Roosevelt, Calvin Coolidge, Harry S. Truman, and Lyndon B. Johnson, who also completed unfinished terms, were elected following those terms.

¹ Prior to the election of 1804, each elector voted for two candidates for President, the one receiving the highest number of votes if a majority, was declared President, the next highest, Vice-President. This provision was modified by the adoption of the 12th amendment, which was proposed by the 8th Congress, in 1803, and declared ratified by the legislatures of three-fourths of the States in a proclamation of the Secretary of State, Sept. 25, 1804.

² No candidate had a majority in the Electoral College, and the election was decided in the House of Representatives. Party designations of candidates were not definite.

³ Whig tickets were pledged to various candidates in various States. The popular vote was divided among them.

⁴ Hayes' election was decided by an electoral commission appointed by Congress when the electoral votes of three States were protested. The commission awarded the votes to Hayes by a vote among its members in which Hayes received one more vote than Tilden.

⁵ One Democratic elector voted for a circuit judge, Walter B. Jones of Alabama.

⁶ Fourteen Democratic electors and one Republican elector voted for Senator Harry F. Byrd of Virginia.

⁷ One Republican elector voted for Professor John Hoppers of California.

⁸ One Republican elector voted for former Governor Ronald W. Reagan of California.

UNITED STATES OF AMERICA, THE

mont, Wyoming, Nevada, and Alaska had less than 500,000 population, but they were nonetheless entitled to one Representative in the House.

The House has special responsibilities for originating revenue bills, although the Senate retains the right to revise or amend the bills, as is the case with any other legislation originating in the House. The House also has special responsibility for electing the President in case the Electoral College fails to give any one candidate a majority of the vote.

Executive Branch. The President, Vice-President, cabinet, and all of the administrative agencies of the Federal government constitute the executive branch. Among the officials in this branch of government, only the President and Vice-President are elected, and the method of their election is indirect, by an Electoral College chosen by popular vote.

The President of the United States holds greater power and a greater range of functions than are usually conferred on presidents and prime ministers in the Western democracies. He serves not only in the largely ceremonial role of chief of state but as chief executive. It is his responsibility to enforce the Constitution and laws enacted by Congress, to appoint all important government officials, including cabinet officers, Federal judges, administrative officials, and diplomatic officials, and to serve as commander in chief of the armed forces. He is also responsible for determining the foreign policy of the country and, with the consent of the Senate, for negotiating treaties with foreign governments. Besides his executive functions, he may veto bills passed by Congress, a process discussed in connection with the legislative branch, above, and he is responsible for entertaining foreign dignitaries.

The President's principal official advisers are the members of his cabinet, whom he appoints. The cabinet now includes eleven members, specifically the secretaries of state; the treasury; defense; the interior; agriculture; commerce; labor; health, education, and welfare; housing and urban development; and transportation; and the attorney general. In addition to the cabinet departments, a number of other special agencies have been established to help the President cope with the increasing complexity of his duties. Some of the most important of these agencies are the National Security Council, the Bureau of the Budget, the Council of Economic Advisers, the Central Intelligence Agency, and the National Aeronautics and Space Administration.

Judicial Branch. The Federal court system includes three levels of Constitutional courts, and a number of legislative courts created by Congress to handle certain types of cases outside the scope of Constitutional courts. All the judges of Federal courts are appointed by the President with the consent of the Senate and serve until death or retirement. They may be removed from office only by means of impeachment.

SUPREME COURT. The highest judicial authority in the land is the Supreme Court of the United States. The Court consists of a chief justice and eight associate justices, who reach their verdicts by a majority vote, which may be as close as five to four. This court of final appeal, which meets from October of each year until the following June, hears cases on appeal from the lower Federal courts. The Supreme Court may also review the decisions of the highest State courts in cases involving the constitutionality of State or Federal laws or the possible violation of civil rights guaranteed under the U.S. Constitution or by Federal laws. The decisions of the Court are final. Its preempted power to nullify legislation is a judicial authority unduplicated in any other country of the world.

OTHER CONSTITUTIONAL COURTS. The lowest courts in the Federal system are the U.S. district courts, of which there are eighty-nine in the fifty States and Federal District and four additional territorial courts. These courts are the first to hear cases, and their decisions may be appealed in the courts of appeals, of which there are eleven for the States and territories of the U.S.

LEGISLATIVE COURTS. These courts include the Court of Claims, which has jurisdiction over claims against the Federal government; the Court of Customs and Patent Appeals, the Customs Court, and the Tax Court.

See also CLAIMS, COURT OF; COURTS IN THE UNITED STATES; COURTS OF APPEALS

Division of Powers. In delegating authority among the three branches of government, the authors of the Constitution applied the principle of checks and balances, an ancient political doctrine that had been elaborated by the 18th-century French philosopher Baron Charles Louis de Montesquieu. As developed by Montesquieu, the doctrine holds that the sovereignty of a people can be preserved only by absolute separation of the legislative, executive, and judicial arms of the government. While impressed by Montesquieu's theory, the Founding Fathers recognized that its strict application would lead to complete frustration of practical government. They accordingly devised a limited system of

checks and balances under which none of the three organs of government received absolute jurisdiction within its own field. The legislative branch, for example, was granted the right to initiate and prosecute impeachment (q.v.) proceedings against the Chief Executive, members of the Federal judiciary, and any civil officer of the government. Such brakes on the executive and the judiciary were deemed advisable because the prerogatives of the chief executive are enormous and because members of the judiciary enjoy life tenure. Important curbs on Presidential authority are the prerogatives of the Senate to withhold approval of Presidential appointments and to approve or reject treaties negotiated by the President. In addition, Congress can impose financial restraints on the President through its power of appropriation. With respect to the authority of the legislative branch, the principal check embodied in the Constitution is the President's qualified power to veto legislation. Another important curb on legislative power is the authority of the Supreme Court to declare laws unconstitutional. Although this is an assumed, rather than a Constitutional power, it has been repeatedly employed by justices of the Supreme Court with great effect.

One of the most subtle of all the checks in the American system of government is aimed at transitory majorities among the electorate. Although the lower legislative body is wholly renewable every two years, six years must elapse before the upper branch can be entirely renewed. Such staggering of Congressional terms of office, along with the four-year term provided for the Chief Executive, makes it unlikely that unstable popular majorities could establish and maintain a government that was contrary to the popular will.

Defense. The Army and Navy of the U.S. were represented separately in the Presidential cabinet until 1947, when the National Security Act placed these two departments and the newly created Department of the Air Force under a civilian secretary of defense. Although they are represented collectively in the cabinet, the three departments are separately administered, each under its own secretary below cabinet rank. Since 1958, however, the secretary of defense has had direct control over all forces in overseas theaters.

The military heads of the Army, Navy, Air Force, and Marine Corps serve as the Joint Chiefs of Staff, a body responsible for advising the President and the secretary of defense on military policy and plans. The Selective Service

System is responsible for the induction of men liable for service in the armed forces; see **SELECTIVE SERVICE**. All male citizens who reach the age of eighteen must register with the Selective Service, but since 1973 the services have been manned by volunteer recruits. Enlistments are for periods of 3, 4, and 6 years. By the end of 1974, the strength of the armed forces had been reduced to 2,153,914 persons. Active forces included some 780,000 Army, 195,000 Marine, 551,500 Navy, and 630,000 Air Force personnel. Additional persons served in the National Guard.

The estimated budget outlay for national defense functions in fiscal 1975 was \$82,095,500,000. See also articles on the individual armed services and **VETERANS ADMINISTRATION**. **Health and Welfare.** The Social Security Act of 1935 is the basic legislation providing financial protection for wage earners and their families in the U.S. This act and subsequent amendments to it provide for a Federal system of Old-Age, Survivors, and Disability Insurance to provide income to a worker and his family when he retires, becomes disabled, or dies. It also makes provision for Federal-State unemployment insurance programs; for Federal grants to States to help in funding public assistance to the aged, to families with dependent children, and to the permanently disabled; and for maternal and child-health services. Since 1966 the system has provided for health insurance to defray many of the costs of medical care for the aged.

The social-security programs of the Federal government are administered by the Department of Health, Education, and Welfare established in 1953. This cabinet-rank department also administers the Public Health Service, which makes grants to hospitals and sponsors medical research; the Food and Drug Administration, which enforces the Pure Food and Drug Acts; and the Office of Education.

The per annum expenditures for Federal social-welfare programs were about \$92,000,000,000 in 1971, almost triple the expenditures made ten years earlier. Social-insurance programs and public aid accounted for almost three quarters of the total. Other welfare activities of the Federal government included veterans' benefits, educational programs, housing programs, and health and medical programs. The Federal government maintained about 400 hospitals, supported a school-lunch program for some 26,000,000 children, and donated about 1,450,000,000 lb. of surplus food to needy families during one year in the early 1970's. See also **HEALTH INSURANCE**; **SOCIAL SECURITY**.

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Local Government. Under the U.S. Constitution, the authority retained by the States prevails over a broad field of government. Among the powers retained by the States are regulation of commerce within their respective boundaries, control of local government and education, qualified control of elections and suffrage, the right to levy and collect taxes for local purposes, and administration of local civil and criminal law. The retention of these and other important powers by the State governments is a fundamental feature of American federalism. See LOCAL GOVERNMENT; STATES' RIGHTS. For information on the separate State governments, refer to articles on the individual States.

Political Parties. See POLITICAL PARTIES IN THE UNITED STATES.

HISTORY

In addition to the many cross references contained in the following account of the history of the United States, the reader is referred also, for supplementary material, to the *History* sections of the articles dealing with the individual States and to the separate articles on the Presidents of

the United States. Further information on persons not identified by life and death dates is included in separate articles on the individuals.

Colonial Developments. The United States did not become a recognized world power until the final quarter of the 18th century, but national history is properly introduced with a brief survey of the chief events leading to the formation of the Union. The voyages, in the last years of the 15th century, of the Italian-born navigators Christopher Columbus and John Cabot, pioneer navigators who helped to open the European era of exploration and colonial expansion, must be ranked as the decisive initial developments. On the strength of Columbus' discoveries and those of following Spanish explorers, Spain staked out a vast domain in the New World. Cabot, sailing in the service of Henry VII, King of England, reached the North American mainland in 1497. On the basis of this voyage England later claimed the entire continent. Among other early voyagers to North America, Giovanni da Verrazano and Jacques Cartier of Italy and France, respectively, also deserve mention. Sailing under the flag of France, they initiated a protracted period of French colonial activity. For further information on exploration in North America, see NORTH AMERICA: *History*.

The founding of Saint Augustine (in what is now Florida) by the Spanish in 1565 marked the

Arriving in the New World but believing themselves to have reached the Indies in Asia, the earliest explorers named the people they found "Indians". In 1626 Dutchman Peter Minuit paid the Canarsie tribe trinkets worth about \$24 for Manhattan Island.

American Museum of Natural History



beginning of colonization within what are now the boundaries of the U.S. For nearly a decade before this event, the position of Spain in the New World and on the high seas had been under attack by England; see *DRAKE, SIR FRANCIS*; *HAWKINS, SIR JOHN*. The bitter struggle between the two powers culminated in 1588 in virtual annihilation of Spanish naval power; see *ARMADA*. After this defeat Spain no longer figured as a potent rival of England for possession of the Atlantic seaboard of North America. Meanwhile, in 1585, an English expedition sponsored by Sir Walter Raleigh had settled on Roanoke Island off the coast of present-day North Carolina, but this attempt at colonization was shortly abandoned. During the next four years Raleigh financed several additional expeditions to the same general region, which was named Virginia in honor of Elizabeth I, "the virgin queen". Like the first, these expeditions were abortive, mainly because the settlers earned the hostility of the natives, the so-called Indians (see *AMERICAN INDIANS*), and were more concerned with gold-hunting than with agriculture.

The first permanent English settlement in North America was Jamestown (q.v.). Established in 1607, Jamestown was a project of the London Company (q.v.), a joint-stock company chartered in 1606 by James I for the purpose of trading and colonizing in North America; see *SMITH, JOHN*. By the terms of the charter, Jamestown was under the direct control of James I, whose policies brought the enterprise to the verge of collapse. In 1609 the London Company was authorized to govern the colony. Additional settlers arrived, tobacco farming and other industries were established, and the colony flourished. In 1619 the company imported the first Negro slaves into Virginia, as the colony was designated, and convoked a representative assembly, the first to meet in North America. Decisions of the assembly were subject to veto by the company. In the same year, private ownership of land was authorized. The liberal independent tendencies of the London Company found little favor with James I. In 1624, after a sharp rebuff from the company, the king secured judicial nullification of its charter and proclaimed Virginia a royal province. Executive power in the new regime was vested in appointees of the crown; however, the colonists were permitted to retain the representative assembly.

During the decade following the settlement of Jamestown, France and the Netherlands, the other leading maritime nations of Europe, actively entered the contest for territory in North America. The French quickly recognized the im-

portance of controlling the Saint Lawrence R., the best available route to the interior. In 1608, as the first step in their strategic design, they founded Québec; see *CHAMPLAIN, SAMUEL DE*. The brilliant achievements of such explorers as Jacques Marquette, Louis Jolliet, and Robert Cavelier, Sieur de La Salle brought tremendous areas of the interior, including the entire Mississippi R. valley, under nominal French ownership during the next seventy-five years. Consolidation of this vast American dominion was impossible for various reasons, especially constant warfare with the Iroquois (q.v.) confederation of Indian tribes. In addition, the French had imported to America the absolutist institutions and traditions of the fatherland. Their colonial policies, diametrically opposed to those of the English, discouraged large-scale immigration and the settlement of numerous enduring communities with responsible local authority. See *CANADA: History*.

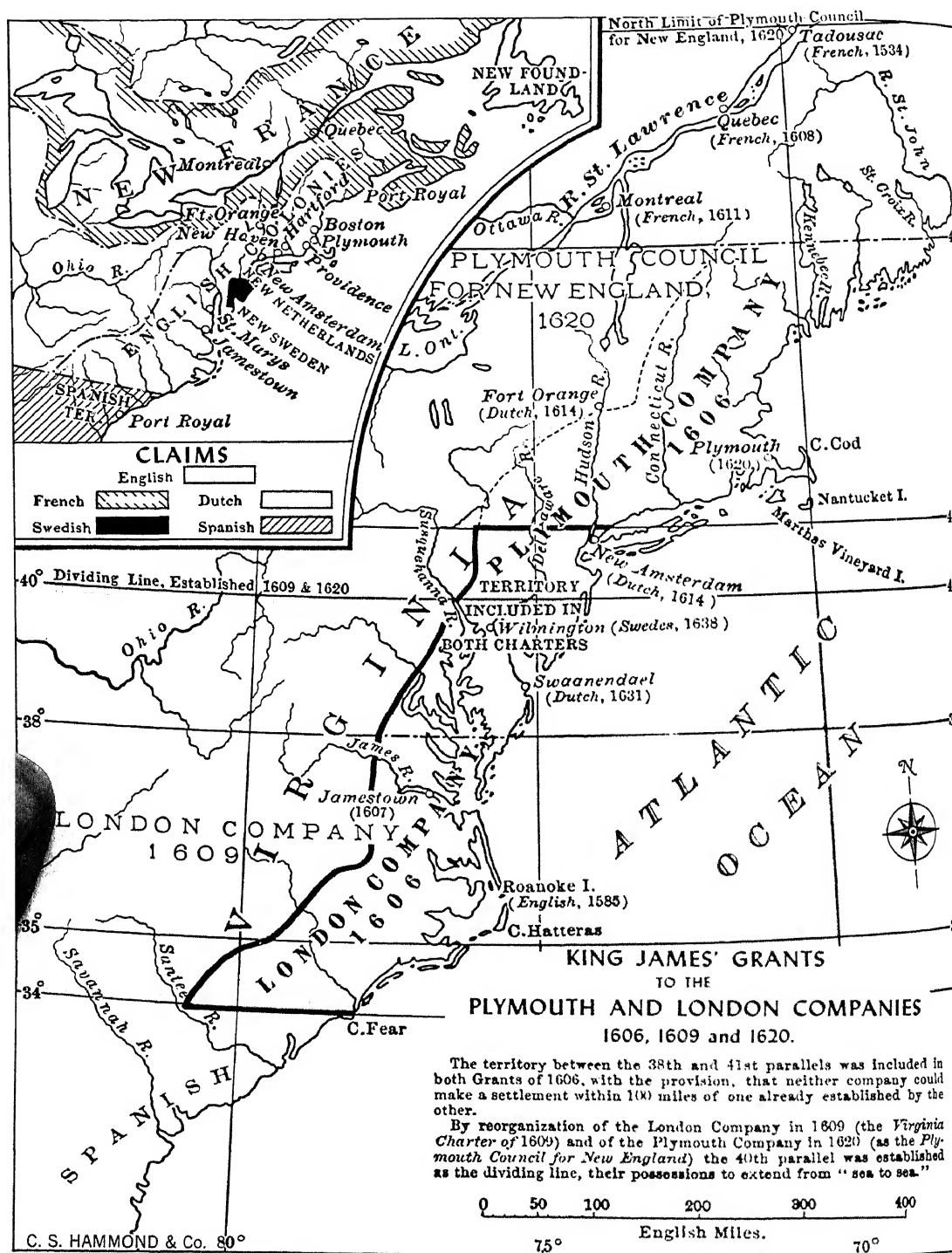
The Dutch based their claims to North American territory on the discoveries of Henry Hud-

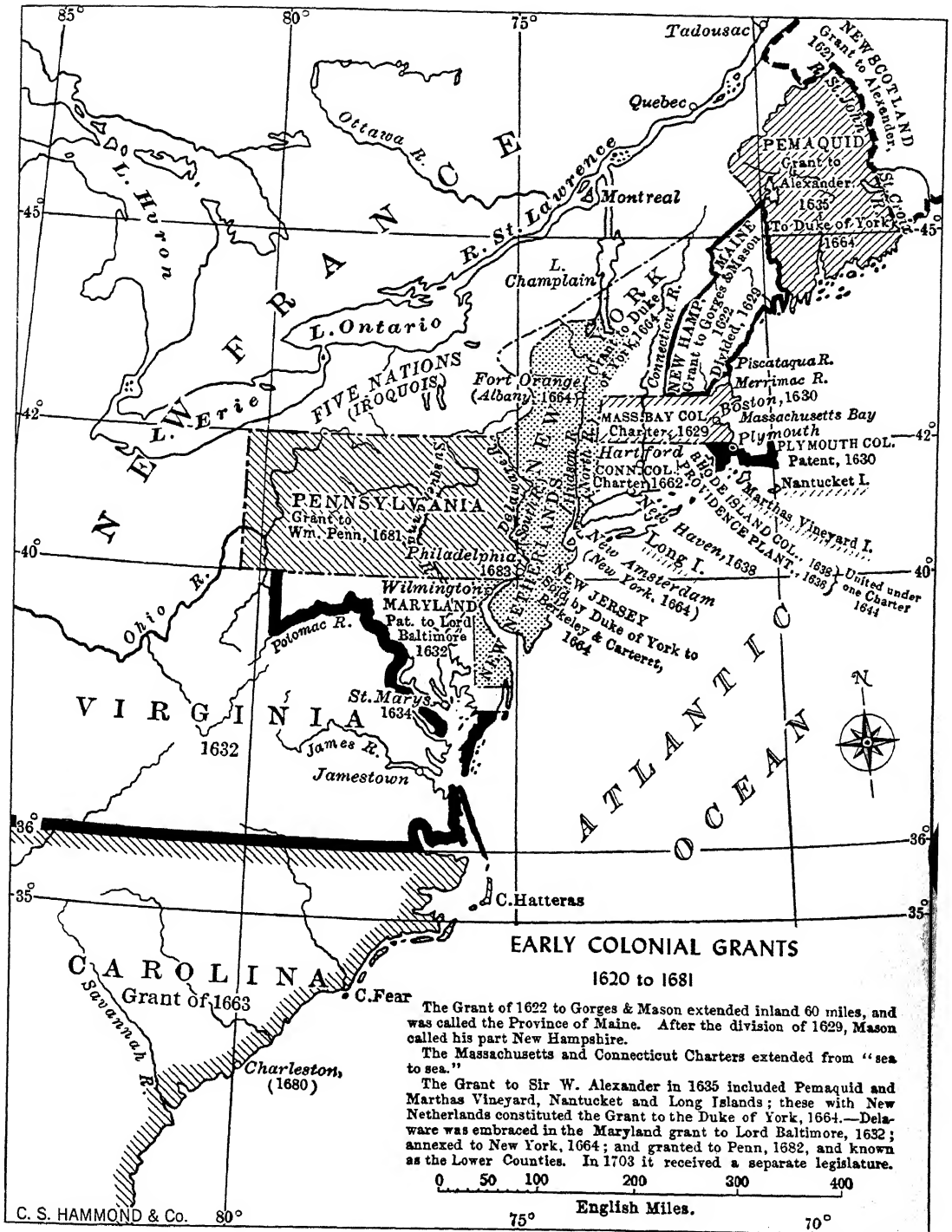
Exploratory expeditions to North America continued to sail under the flags of England, France, and the Netherlands. The Indians gave the explorers fur, hides, and food, and sometimes acted as guides.

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son. An English mariner in the employ of the Dutch East India Company, Hudson had, in 1609, entered present-day New York Bay and explored the river that now bears his name. During the next few years the Dutch dispatched several trading vessels to the region, which they named New Netherland. Trading posts were founded on Manhattan Island and near the site of modern Albany in 1613–14. Because of the profitable fur trade, the Dutch made no immediate attempt to colonize New Netherland. Permanent colonists began to arrive in 1624, and New Amsterdam (now New York City) was founded two years later. New Netherland grew slowly. Constant friction or warfare with the Indians, administrative incompetence, and internal unrest were characteristic, and the colony never attained the stability and vigor of Virginia or of the English colonies later founded in America.

The Growth of English Activity. English colonizing activity had been resumed about six years before the founding of New Amsterdam. In 1620 a party of English Separatists, a dissident sect that had previously withdrawn from the Church of England, received permission from the London Company to settle in Virginia. Through an error in navigation, the *Mayflower* (q.v.), which brought the group to America, entered Massachusetts Bay and dropped anchor in what is now the harbor of Provincetown, Mass. On Nov. 21, 1620, forty-one Separatists, who are better known as the Pilgrim Fathers (q.v.), gathered in the cabin of the vessel and drew up and signed the Mayflower Compact. This document, the first written American constitution, embodied a concise plan for democratic self-government. Several weeks later the Pilgrims founded Plymouth Colony (q.v.), on a site near the head of Cape Cod.

The organization of Plymouth Colony inaugurated a sustained and significant phase of English activity in America, that is, the colonization of New England. This phase, which gained rapid momentum after the establishment (1628–30) of Massachusetts Bay Colony by Puritans (q.v.), profoundly influenced the course of American cultural, religious, economic, and political history. The political significance warrants special emphasis. In possession of a corporate charter, the Massachusetts colonists, after a period of theocratic rule, developed a complete system of self-government. Characteristic features of the system, on which the governments of Connecticut and Rhode Island were subsequently modeled, included a representative legislative body, or general court, and an elected governor. With

such institutions, Massachusetts Bay Colony represented an intolerable provocation to Charles I, the despotic successor of James I. In 1634 the Massachusetts leaders defied the king's demand for the surrender of their charter, granted five years earlier. Only the contemporary political turmoil in England restrained the king from employing force against them. Several decades elapsed before royal curbs were imposed on the colony. In the interim, Massachusetts and its closely related neighbors grew, prospered, and deepened their democratic traditions.

Not surprisingly, the English crown issued no more corporate charters for colonization projects in America. Beginning with Maryland, which was founded in 1632 as a refuge for Roman Catholics and others, all of the new colonies were organized according to the provisions of proprietary charters. As in the case of Virginia, before its transformation into a royal province, the people of the proprietary provinces received qualified legislative privileges, but administrative authority was vested in the charter grantees and hence, ultimately, in the crown.

With the exception of Georgia, which was chartered in 1733, all of these English proprietary colonies in North America were organized before the end of the 17th century. A company of eight English nobles was granted, in 1663, the region comprising present-day North Carolina and South Carolina. New Netherland, lying across the lines of communications between the northern and southern possessions of England, was annexed in 1664 and renamed New York; see MANHATTAN; *History*; STUYVESANT, PETER. New Jersey, mainly comprising territory that the Dutch had previously seized from Sweden, was formed in the same year. Fifteen years later New Hampshire, consisting of settlements formerly under the jurisdiction of Massachusetts, was organized. In 1681 William Penn received a charter for the region that he named Pennsylvania.

In terms of broad and far-reaching political developments, this period of English colonial expansion and consolidation along the eastern seaboard of North America was notable for a number of reasons. The fanatical persecution of Puritans in England by Charles I drove numerous refugees to America, especially to New England; at home, his tyrannous policies provoked the Great Rebellion (q.v.) in 1642, which in turn led to his own execution, to the formation in 1649 of the Commonwealth, and to the gradual emergence of Parliament (q.v.) as the real ruler of the country and its colonies. In relation to the

colonies, the first manifestation of Parliamentary authority was the Navigation Act of 1651, which required that colonial imports and exports be shipped in English-flag vessels. The first of a long series of increasingly stringent enactments designed to regulate and restrict colonial commerce and industry, this act and those that followed sought to guarantee the benefits theoretically inherent in mercantilism; see *MERCANTILE SYSTEM, THE*. Essentially, the enactments prohibited commercial relations between the colonies and non-English nations. Inasmuch as colonial prosperity was largely dependent on the free interchange of goods with such nations, the laws were unenforceable. Smuggling and other illicit activities became a fundamental feature of American trade and industry. Under the circumstances, contempt for the home government and its measures was eventually woven into the fabric of American colonial mores; see *BACON'S REBELLION*.

In 1660, following the death of Oliver Cromwell and the end of the Protectorate, Charles II was restored to the English throne. This development, a triumph for the most reactionary political grouping in England, foreshadowed important events in America. Besides seizing New Netherland, the new English regime broadened the Navigation Laws and transformed New Hampshire and Massachusetts into royal provinces. The revocation of the Massachusetts charter in 1684 reflected royal hostility to the trade violations, autonomous status, and generally independent attitude of the colony. In 1686 James II, the successor of Charles II, decreed the unification of New York, New Jersey, and the New England colonies into a single royal province. Colonial resistance to the change, which was accompanied by many usurpations of time-honored rights, notably in Massachusetts, assumed various forms. Connecticut and Rhode Island refused to yield their charters to Sir Edmund Andros, the royal governor. In Massachusetts, popular sentiment favored rebellion, and in 1689, following the Glorious Revolution in England, the Boston populace arrested Andros, seized control of the colonial government, and dispatched emissaries and greetings to William III and Mary II, the new English sovereigns. New York City was the scene of even more dramatic occurrences.

Wars Between the British and the French. The accession of William and Mary in 1689 occasioned a complete reversal of English diplomatic policy. As a result of the change, which had immediate and long-continuing repercussions in North America, the government chal-

lenged the military power of France, its chief rival for colonial empire. The accession of Anne and the formation of Great Britain, politically uniting Scotland, England, and Wales, by the Act of Union, intensified the conflict. The ensuing struggle, extending in successive phases over nearly three quarters of a century, was fought in many parts of the world. In North America, probably the most fiercely contested battleground of the conflict, its successive phases were King William's War (1689–97), Queen Anne's War (1702–13), King George's War (1744–48), and the French and Indian War (1754–63) (q.v.). The French regime in North America possessed a variety of advantages in these wars. The regime was highly centralized, had a disciplined military machine, and numbered many Indian tribes among its allies. British intercolonial unity was neither existent nor apparently realizable (see *ALBANY CONVENTION*), and there was no colonial military machine. On the other hand, the British had vast numerical superiority when the struggle began, with about 400,000 colonists compared to about 18,000 in the French domain. Moreover, although universally hated by a majority of the Indian tribes, the British colonials had the support of the powerful Iroquois, traditional foes of the French.

Sanguinary border warfare, marked by frequent French-instigated massacres of British colonials by Indians, was the principal feature of the opening war, which ended in stalemate. By the terms of the Peace of Utrecht, which terminated the second phase (known in Europe as the War of the Spanish Succession), France was forced to relinquish considerable territory in North America, including Acadia (q.v.), Newfoundland, and the region surrounding Hudson Bay; see *UTRECHT, PEACE OF*. Tension between Great Britain and France mounted steadily after King George's War, which was also indecisive. The British colonies in North America had grown greatly in population since the opening of the 18th century. When the French and Indian War began, their aggregate population was about 1,300,000. Territorial growth, however, had been limited to the northern areas acquired in 1713. France and Spain maintained a determined and aggressive hold on the rich regions adjacent to British America, threatening its security and blocking future expansion. Thus, although competition for possession of the Ohio R. valley was the *casus belli* of the final phase of the Anglo-French struggle, the French and Indian War quickly became a contest for domination of the entire continent. Severe blows were dealt to France by Great Britain and its allies in

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the European extension of the conflict; see SEVEN YEARS' WAR. In North America, the British colonials, aided substantially by the Iroquois, bore the brunt of the fighting. An almost unbroken sequence of British colonial victories brought French capitulation in 1763. Under the victors' terms, France lost all of its possessions on the North American mainland. The entire region east of the Mississippi and all of the French holdings in what is now Canada were ceded to Great Britain. Spain, an ally of France during the war, surrendered Florida, but was granted control of French territories west of the Mississippi.

The British colonies in America emerged from the French and Indian War with most of the prerequisites of nationhood. Formal political unification had not, of course, been accomplished, but the war necessitated considerable practical cooperation among the various colonies. In addition, the American colonials returned to peacetime conditions with confidence born of achievement on the field of battle.

The Rise of Colonial Resistance. The British government had generally disregarded Ameri-

can violations of the Navigation Acts during the struggle with France. Because prosecution of the war had doubled the national public debt, the ruling circles in Great Britain were compelled to find means of increasing government revenues. Accordingly, measures to secure enforcement of the Navigation Acts were adopted by the British Parliament in 1764. To obtain additional revenue Parliament also adopted, in 1765, a Stamp Act (q.v.), requiring Americans to validate various documents, transactions, and purchases by buying and applying stamps issued by the royal government.

Passage of the Stamp Act aroused widespread indignation and opposition among the American colonists, especially in Virginia, New York, and Massachusetts; see COMMITTEES OF CORRESPONDENCE; COMMITTEES OF SAFETY; HENRY, PATRICK; OTIS, JAMES. Protest meetings, riotous demonstrations, and other manifestations of popular hostility occurred in practically every urban center. Nearly all officials responsible for execution of the Stamp Act were forced to resign, and many of the stamps were seized and destroyed. Chapters of the Sons of Liberty (q.v.), a secret society



English activity in America resulted in the establishment, and later expansion, of strong colonies along the eastern seaboard. As elsewhere in her empire, England tried to control colonial trade. When in the 17th and 18th centuries an extensive period of warfare with France drained England's treasury, Parliament passed laws extending and increasing taxes in the American colonies. The colonists chafed under the curbs and some vented their anger on the king's representatives, for example, the unpopular excise agent shown being tarred and feathered. Fiery patriots further defied the British government by boycotting, and sometimes destroying, British goods.

New York Historical Society



Defiance erupted into revolution. On April 19, 1775, colonial minutemen clashed with British soldiers at Lexington, Mass.

American Museum of Photography

of patriots, were formed in numerous communities. The intercolonial protest movement, in its political implications a mighty upsurge against taxation without representation, culminated in October, 1765, in the Stamp Act Congress (q.v.), the first important demonstration of American political unity. Parliament refused to recognize the adoption by the Congress of a petition of rights, privileges, and grievances, but the Stamp Act was repealed in 1766.

After a change of leadership in the British government, the policy of imposing direct taxes on the American colonies was revived in 1767. Parliament approved a series of measures, known in history as the Townshend Acts (q.v.), which, among other things, levied high duties on tea, paper, lead, and glass. Colonial resistance to the Townshend Acts included boycotts of British goods, intercolonial expressions of condemnation, and, in Massachusetts, open defiance of the British government by the general court. In reply to the seditious sentiments prevalent in Massachusetts, Great Britain in 1768 transferred two regiments of troops to the Boston area. The troops served merely to intensify the anti-British feelings among Bostonians. Finally, on March 5, 1770, a contingent of British

soldiers dispersed a crowd of hecklers with gunfire, producing the first bloodshed of the burgeoning struggle; see BOSTON MASSACRE.

Alarmed at the effectiveness of the American boycott, Parliament in 1770 repealed all of the Townshend duties except the tax on tea. The Americans, regarding the duty as intolerable because it insured a trading monopoly in tea for the East India Company (q.v.), not only intensified the boycott but, in several ports, destroyed cargoes of tea; see BOSTON TEA PARTY.

Parliamentary reaction to the events in Boston was swift and harsh. By enactments adopted in March, 1774, Parliament closed the port of Boston, prohibited town meetings everywhere in Massachusetts, and imposed other odious penalties; see BOSTON PORT BILL. Intercolonial indignation over this legislation paved the way for convocation in September, 1774, of the first Continental Congress (q.v.). The Congress drafted a petition to the British sovereign, George III, for a redress of grievances, called for intensification of the boycott on trade with Great Britain, and completed plans for a new



The conflict intensified. George Washington (right) planned strategy with the French military leader Lafayette (left) at Mount Vernon. Metropolitan Museum of Art

Congress in May, 1775, in the event of British refusal to grant its demands.

Less than four months after receipt in America of the news that Parliament had rejected the Congress petition and had characterized the colonial protest movement as rebellion, the people of Massachusetts resorted to arms in defense of their liberty. The royal governor of Massachusetts, General Thomas Gage, ordered, on April 18, 1775, the arrest of John Hancock and Samuel Adams, outstanding leaders of the colonial cause, and dispatched troops against Lexington and Concord (qq.v.), repositories of colonial munitions; see REVERE, PAUL. On the following day, units of the Massachusetts militia met the British regulars at Lexington, precipitating the first battle of the American Revolution.

The second Continental Congress convened at Philadelphia on May 10, 1775. Formally investing itself with intercolonial governmental authority, the Congress proclaimed American determination to resist British aggression with armed force, provided for establishment of a Continental Army with George Washington as commander in chief, authorized the issuance of paper money, and assumed various other prerogatives of sovereign power. Another appeal for a peaceful solution of the crisis was directed

to the British government. In August, George III responded with a proclamation exhorting his "loyal subjects" to "suppress rebellion and sedition" in North America. Meanwhile, British-held Fort Ticonderoga had fallen to Ethan Allen and the Green Mountain Boys (q.v.), and American troops had inflicted severe casualties on a large force of British regulars at Charlestown, Mass.; see BUNKER HILL, BATTLE OF. Popular sentiment for a complete break with Great Britain and for national independence gathered steady momentum in the colonies after the inspiring events at Bunker Hill. On July 4, 1776, the second Continental Congress embodied this sentiment in the Declaration of Independence (q.v.). This document, one of the most momentous in the annals of mankind, heralded the creation of a new nation. Details of the struggle for national survival are contained in the article on the American Revolution.

The Growth of the Nation. In the period between 1783 and 1865, the confederation that was formed in 1776 grew from thirteen component States to a nation of thirty-six States; earned the respect of foreign nations; and increased greatly in territory, population, and wealth. The infant nation also confronted serious social, economic, and political problems, of which the two most important were the question of whether the authority of the Federal government or that of the individual States was

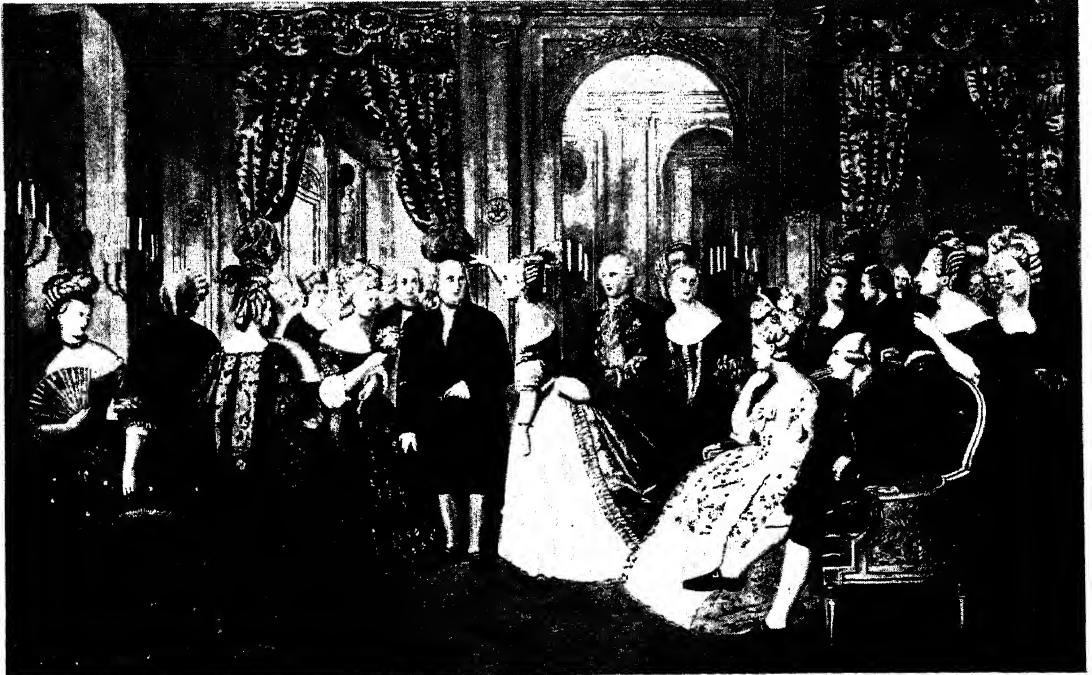
to prevail, and to what extent the institution of Negro slavery should be permitted to grow in the nation. The controversy over these issues, beginning with the very formation of the Constitution, became more acute as time went on and divided the country into two antagonistic sections, the North and the South. In the fifth decade of the 19th century the conflict of interests, opinions, and ideals became so violent as to threaten the very existence of the Union. Diplomacy and compromise failed to solve the controversy, and only after a four-year civil war between the North and the South were the issues finally settled.

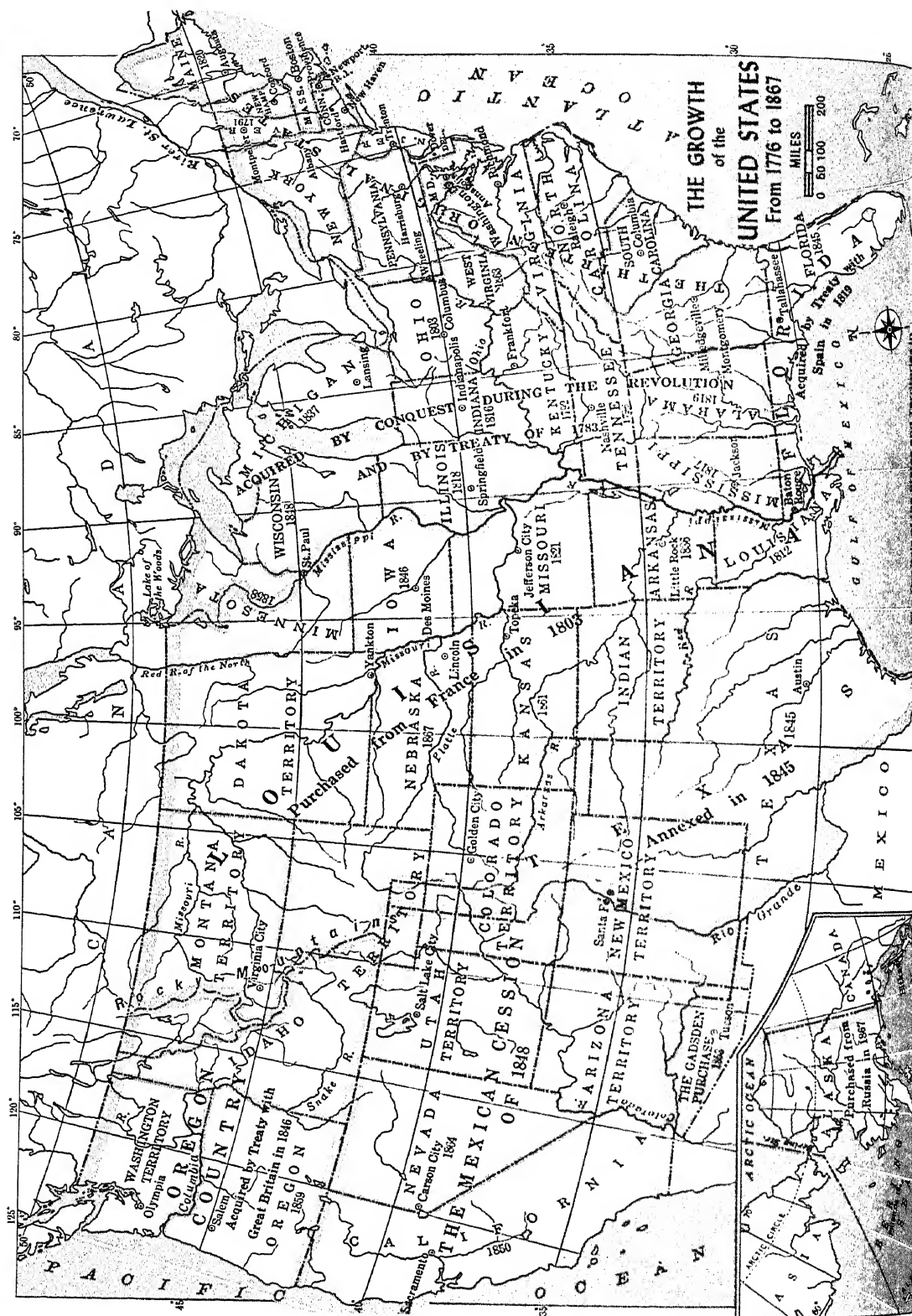
FORMING THE NEW NATION (1783–89). By winning the War of Independence, the United States emerged successfully from its first severe test as a nation. With the signing in Paris, in 1783, of the peace treaty with Great Britain, the nation found itself confronted with new problems, of which the principal one was that of devising a form of government that would bind the thirteen States into a strong and efficient Union. See **PARIS, TREATY OF.**

From 1776 to 1781 the States had been governed by the Continental Congress. The authority of this body was ill-defined. The most important governmental powers, such as raising an army, borrowing money from foreign countries, and concluding treaties, the Congress did not possess by legal right but had assumed in the

national emergency created by the struggle against Great Britain. To provide for the States a national governing body with better defined and stronger powers than those of the Continental Congress, shortly after the colonies had declared their independence, a committee consisting of one representative from each of the States drew up the agreement known as the Articles of Confederation (q.v.). The Articles were approved by the Congress in 1777 and were ratified successively by the various States, the last to do so being Maryland, in 1781. Maryland placed upon its ratification a condition that resulted in the solution of another of the problems then agitating the nation: the conflicting claims of a number of the States to parts of the region lying west of the Allegheny Mts. and extending to the Mississippi R. Six of the States based their claims on old colonial charters, and one based its claim on an Indian treaty; and each State sought to impose its jurisdiction on the areas it declared its own. Maryland agreed to enter the Confederation only if all the States concerned ceded to the U.S. their claims to these lands. The States involved agreed to this condition, and, beginning with New York in 1781 and ending with Georgia in 1802, all made the necessary cessions.

The colonists found a powerful ally in another English rival, France. Benjamin Franklin solicited economic and military aid at the French court.
Library of Congress





Despite the need for a strong national government that had resulted in the drawing up of the Articles of Confederation, the States were unwilling to abandon any of their own powers to a central government, and they gave the Congress, the national governing body under the Articles, little real authority. The Congress possessed no executive or judicial power, no control of commerce, and no means of taxation. For example, the Congress could only request the States for money with which to run the government, and the States might contribute or withhold funds at their pleasure; nor did Congress have the power to regulate the amount of money a State could issue. Such limitation of power made it impossible for the Congress to keep domestic peace or inspire respect abroad. During the period in which the Articles were in force, violent political, social, and economic conflicts took place throughout the country. The States engaged in boundary disputes that occasionally resulted in bloodshed; levied taxes against one another's commerce; and issued money when and in whatever amounts they pleased. Some States, such as Rhode Island, inflated their currency to meet the business depression and currency deflation that had followed the Revolution. Other States, such as Massachusetts, refused to ease the plight of the debtor class by issuing more money. Certain residents of Massachusetts blamed this refusal for their lack of funds with which to pay taxes and mortgage interest; and in 1786–87 about 1500 farmers and laborers, led by Captain Daniel Shays (1747?–1825), revolted against the authority of both Massachusetts and the Federal government. The State government put down the uprising, but Shays' Rebellion (q.v.) emphasized the need for a central government that could command respect throughout the nation. During its entire period of administration under the Articles of Confederation, the Congress passed only one important piece of legislation, the Ordinance of 1787, which organized the national domain, known as the Northwest Territory (q.v.), between the Ohio R. and the Great Lakes. The ordinance provided a governor and three judges for the region, established free education, and excluded slavery from the States later to be formed in the area (Ohio, Indiana, Illinois, Michigan, Wisconsin, and part of Minnesota).

Many of the leading statesmen of the nation realized that the U.S. would not long endure unless it were provided with a stronger central government than that supplied by the Articles of Confederation. The Congress itself saw the need and in 1787 called a convention of dele-

gates from all the States to devise a new system of government. Rhode Island sent no delegates to the convention, fearing that its commerce would be hindered by Federal control and that, being a small State, it would receive inadequate political representation. Meeting at Philadelphia from May to September, with George Washington as chairman, the convention drew up the Constitution of the United States. Much conflict took place during the convention and immediately afterward, and it was necessary for important compromises to be made between the contending parties before the Constitution was finally adopted by the convention; see CONSTITUTION OF THE UNITED STATES: *The Constitutional Convention; Struggle over the Ratification of the Constitution*. In general, the Constitution succeeded in laying the foundations for an efficient union among the States by substituting for the weak Congress of the Articles of Confederation a government of three departments, executive, legislative, and judicial, which exerts authority not through the States, as provided by the Articles, but directly upon all the people of the U.S.

The First Party Conflict: Federalists vs. Democratic-Republicans. The Constitution became the law of the land in 1788, after nine States had ratified it; by 1790 all thirteen had ratified. On March 4, 1789, the first Congress of the United States (q.v.) elected under the Constitution assembled in New York City, then the national capital; see CAPITALS OF THE UNITED STATES. On April 30, George Washington, who had been unanimously elected the first President of the United States, was inaugurated in New York City; he was reelected in 1793. The outstanding achievements during Washington's first administration were those of his secretary of the treasury, Alexander Hamilton. By having the government pay the debts the Continental Congress had incurred in France and the Netherlands during the war, and also the debts owed by the government to its own citizens, Hamilton established confidence in the credit of the U.S.; and by having the national government assume the debts of the various States, he established the concept that the Federal government was more important than any of its component States. He also established the First Bank of the United States as a central financial authority; the First Bank was privately owned but subsidized in part by the government, and acted as fiscal agent for the government; see BANKS AND BANKING: *United States Banking System*. Also as a result of Hamilton's efforts, Congress levied a tariff on imported goods, the purpose of which

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was principally to raise revenue but also to some extent to encourage or "protect" domestic industries.

Hamilton's financial policies aroused opposition among those who felt the measures neglected the agricultural class and favored the bankers and manufacturers. The debates in Congress and elsewhere in 1790 and 1791 over Hamilton's measures revealed a distinct cleavage in the political and economic ideas of the nation, and this division soon became manifest in the formation of the first two important political parties in U.S. history: the Federalist Party and the Democratic-Republican Party; see **POLITICAL PARTIES IN THE UNITED STATES**. The latter soon became known as the Republican Party (not to be confused with the Republican Party formed in 1854 and still in existence). The Federalists and Republicans were at variance chiefly in their attitudes on the respective powers of the Federal government and of the States. The Federalists advocated a strong Federal government existing to serve the interests of all the people, but guided by the educated and wealthy classes. The Republicans, whose outstanding leader was Thomas Jefferson, believed in the ability of the common people to function as their own governmental officers, and advocated strict limitation of Federal powers and protection of States' rights. The Federalist Party was supported by the moneyed and aristocratic classes, especially the commercial interests in New England; the Republicans were supported mainly by farmers, particularly in the South, and by artisans and other classes of workers. The two parties also disagreed strongly on U.S. foreign policy. The followers of Jefferson were in sympathy with the ideas and achievements of the French Revolution (q.v.), then at its height, regarding the Revolution as a notable example of the winning of political and economic freedom by a people; the Federalists looked upon the Revolution as an example of chaotic subversion of established law and order. The Federalists were in favor of strict neutrality; the Republicans favored aid to France against Great Britain. President Washington inclined toward the Federalist point of view, and in 1793 proclaimed a policy of U.S. neutrality in the wars being waged between Great Britain and France. Washington, and after him John Adams, who as candidate of the Federalist Party in 1796 defeated Jefferson for the Presidency, adhered to the policy of neutrality even though both France and Great Britain committed acts that violated American neutral rights and aroused the Federalists to demand war upon the former

and the Republicans to insist on war upon the latter. Disputes between Great Britain and the U.S. arising from the French-British wars were temporarily settled by Jay's Treaty (q.v.) in 1795; and Adams signed a convention with Napoleon I in February, 1801, that insured peace between France and the U.S.

In domestic matters the antagonism between Federalists and Republicans came to a head in 1798, when the Federalist-controlled Congress passed the Alien and Sedition Acts (q.v.), which were designed to silence all Republican criticism of Federalist policy both domestic and foreign. The Republicans claimed that these enactments were unconstitutional, infringing upon the rights of free speech and press. The Kentucky Resolutions, written by Jefferson and passed by the legislature of Kentucky, promulgated the theory of States' rights, strictly limiting the powers of the Federal government and reserving to the States all powers not explicitly forbidden to them by the Constitution; see **KENTUCKY AND VIRGINIA RESOLUTIONS**. The Alien and Sedition Acts provided the principal issue in the Presidential election of 1800. This election was won by the Republican candidate, Jefferson, whose victory signified a repudiation by the people of the Federalist theory that the government should be conducted by the "rich, the well born, and the able" and the triumph of the theory that the government could be conducted by the people themselves. The Federalist Party, although it nominated Presidential candidates through the election of 1816, never again won a national election.

Republican Rule (1801-15). Despite Federalist fears that Jefferson would introduce radical economic reforms, the newly elected President found it necessary to leave undisturbed many of the laws and institutions, such as the tariff and the Bank of the United States, that were criticized by his followers. In accord with Republican principles, however, he substituted simple manners and frugality at the Presidential mansion, called after 1814 the White House, for the ceremonious and elaborate way of life of his Federalist predecessors. Under Jefferson's secretary of the treasury, Albert Gallatin, strict economy in national expenditures was introduced; military and naval appropriations were severely cut, and 70 percent of the national revenue was applied to reducing the national debt. The most important event in Jefferson's first administration was the acquisition by the U.S. of the territory extending from its western boundary, the Mississippi R., to the Rocky Mts. and from the Gulf of Mexico to Canada. Originally a Spanish

possession, this vast area had been ceded by Spain to France in 1800 by the secret Treaty of San Ildefonso. Although one of Jefferson's cardinal political principles was that the powers of the President were strictly limited by the Constitution, and the Constitution nowhere empowers the President to purchase foreign territory, the advantage of acquiring the area, called Louisiana, was so apparent and so great that in 1803 he concluded a treaty with France purchasing the region for \$15,000,000. By this act he doubled the area of the U.S. Fourteen States were subsequently created, wholly or in part, out of the Louisiana territory, and they added immensely to the wealth and power of the nation. See LOUISIANA PURCHASE.

Jefferson was reelected in 1804. His second administration was marked chiefly by growing tension in foreign affairs. Both Great Britain and France in their wars against each other, which were becoming more and more intense, adopted restrictive economic measures that had the effect of injuring neutral, and especially American, commerce. In order to force withdrawal of these measures, Jefferson had Congress pass a number of acts designed to deprive Great Britain and France of American goods and to exclude their products from the U.S.; the more important of these measures were the Non-Intercourse Act (1806) and the Embargo Act (1807). These acts, and similar measures taken in the administration of Jefferson's successor, James Madison, also a Republican, failed to bring about any change in the policies of Great Britain and France, and resulted in severe financial loss to American merchants and ship-owners. Great feeling arose against France and especially against Great Britain, which not only had inflicted great damage on American commerce, but also had treated with insolence American diplomats seeking to remedy the situation. In the forcible exercise of the assumed right to search American ships for deserters from the British navy, the British seized many American citizens and impressed them into the British naval service. A demand for war against Great Britain arose in the U.S., especially among the inhabitants of the Mississippi and Ohio valleys, who saw in such a war an opportunity to conquer Canada. Alleged British aid to the Indian chief Tecumseh, in his armed resistance in 1811 to American westward expansion, created additional animosity toward Great Britain. In June, 1812, at the continued urging of Congress, which was dominated by the war party (see CLAY, HENRY), President Madison sent Congress a message pointing out the outrages committed

by Great Britain, and Congress promptly issued a declaration of war.

The War of 1812 (q.v.) settled none of the issues that had brought it about; the Treaty of Ghent, which brought the war to a close in 1814, merely restored conditions between the belligerents to what they had been before the struggle. The war nevertheless had two important results in the U.S.: it created a strong feeling of national union and increased the control of the Federal government over the national life; and it put an end for the time being to dominance of American political affairs by European events. See CONTINENTAL SYSTEM; EMBARGO ACT; GHENT, TREATY OF.

The Rivalry Between Sectional Interests (1815-40).

The strong national feeling engendered by the War of 1812 made itself manifest in a number of ways. Congress had levied a high tariff in 1812 to raise money for the war; in 1816 it increased the already high duties of the tariff in order to protect the growing manufacturing industries of the nation from the great quantities of low-priced goods being imported from Great Britain. The Republican Party had always been antagonistic to the Bank of the United States, and after the charter of the bank expired in 1811 refused to renew it. Banking as conducted by State-chartered banks, however, proved thoroughly unsound during the War of 1812; and in 1816, in order to put an end to the chaotic financial conditions then prevailing, the Republican-dominated Congress issued a charter for the Second Bank of the United States. The decade following the War of 1812 also saw the powers of the Federal government augmented by a number of important decisions of the Supreme Court, under Chief Justice John Marshall, which limited various legislative and executive powers of the States. The decade also witnessed a further expansion of the national territory when, in 1819, Spain ceded Florida (then East Florida) to the U.S.; West Florida, a strip of land along the Gulf of Mexico extending westward from East Florida to the mouth of the Mississippi R., had been forcibly annexed by the U.S. in 1810. In foreign affairs the strong national spirit was demonstrated chiefly in the promulgation of the Monroe Doctrine (q.v.), a statement of policy by President James Monroe that announced the determination of the U.S. to prevent any further colonization by European nations in either South or North America. The statement also pledged the U.S. to aid the South American republics, formed in the first quarter of the 19th century by revolt from Spain, in defense of their independence.

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This period of strong national union, often referred to as "the era of good feeling", was, however, a prelude to the era of strife between various sections of the nation over economic, social, and political issues that was destined to go on for four decades and culminate in the Civil War. Beginning toward the end of Monroe's administration, three sections of the U.S., each of which had developed different types of economic and social life and political ideas, began to struggle with one another for control of the Presidency and Congress in order to secure national policies that would promote their individual welfare. The three sections were the West, the South, and the Northeast.

WESTWARD MIGRATION. The West, the region lying west of the Allegheny Mts., had by this time (1824) been settled by people from the seaboard colonies or States in two successive waves of migration. The first began after the region was secured to Great Britain from the French by its victory in 1763 in the French and Indian War, and then won from Great Britain during the American Revolution chiefly by the victories of American forces under George Rogers Clark; the

A new continent remained to be settled, but the way West would be made against great odds. For meat the pioneers, like the Indians, stalked the wild buffalo herds.

Smithsonian Institution

first wave of migration continued to the end of the 18th century. By the last decade of the century a number of sections of the frontier territories had become sufficiently populated to enter the Union. Vermont, a frontier region settled chiefly by New Englanders, became a State in 1791; Kentucky, in 1792; Tennessee, in 1796; and Ohio, in 1803. The westward movement slackened during Jefferson's first administration, which was characterized by business prosperity in the East. When restrictions on business, brought about by the Non-Intercourse Act, the Embargo, and the War of 1812, caused economic troubles in the East, beginning about 1806, the westward movement was resumed and a second great wave of migration took place. It resulted in the addition to the Union of Louisiana (1812), Indiana (1816), Mississippi (1817), Illinois (1818), and Alabama (1819); for the admission into the Union of the State of Missouri (1821), see below.

Life in the frontier territories and States was laborious and dangerous. The effort to establish farms and homes on uncleared land, to repel hostile Indians, and to form communities, local governments, and finally States, engendered the qualities of courage, self-reliance, initiative, and endurance. In the frontier regions a man was valued not for his ancestry, breeding, or educa-





"The Luckless Hunter", a bleak frontier scene by the late 19th-century American artist Frederic Remington.

Library of Congress

tion, but for his ability and willingness to work with his hands. A democratic spirit prevailed: each man considered himself the equal of his fellows and entitled to the same rights. Belief was strong in the ability of the people to govern themselves and in a strong State government as opposed to a powerful Federal government.

COTTON AND THE SOUTH. The economy and social life of the South, also an agricultural region, differed considerably from that of the West. The South was principally devoted to the growing of one crop, cotton; this was done on large plantations with Negro slave labor. In contrast to the hardy, vigorous, and crude life of the Western frontiersman, the Southern planter led a life characterized by aristocratic social grace and culture. Nevertheless, the interests of the West and the South, both devoted largely to agriculture, were similar in the early period of sectional conflict, and both sections had the same leaders. But as time went on, the conflict between North and South on the issue of slavery and the

preservation of the Union overshadowed every other sectional conflict; and in this fundamental difference the various Western States took the side of the section, North or South, in which they were geographically situated.

MANUFACTURING AND THE NORTHEAST. The economic life of the Northeast, comprising the New England States, New York, New Jersey, and eastern Pennsylvania, was marked in the first two decades of the 19th century by a decrease in agricultural activity, caused largely by the migration of farmers to the cheaper and more fertile lands of the West. A substitute had to be found for agriculture, and also for the shipbuilding industry and foreign trade, both of which had been nearly ruined by the economic warfare waged by Presidents Jefferson and Madison against Great Britain and finally by the War of 1812. Consequently, the Northeast, also stimulated by the new inventions and processes of



Social life in newly settled sections: "The Flax-Scutching Bee" (1885) by American artist Linton Park (1826–1906).

National Gallery of Art

the industrial revolution (q.v.), became a great manufacturing center. Everywhere in the region home industries employing manual power gave way to factories using machinery driven at first by water power and then by steam power; and numerous small farming towns, such as Lowell, Mass., rapidly grew into industrial cities. The large cities, Boston, New York, Philadelphia, and Baltimore, also began to grow at an unprecedented rate; important in their growth were the canals and railroads being built at the same time between West and East, giving to the great trading centers easier access to the products of the West. These new means of transportation took the place of the crude roads that had been almost the only means of East-West travel in the first quarter of the 19th century. The Erie Canal was completed in New York State in 1825. Railroads included the Mohawk and Hudson (started in 1825; later part of the New York Central), the Pennsylvania Railroad (1827), and the Baltimore and Ohio (1828). The Northeast was conservative in politics and social life; financial and political power in the section was in the hands of the manufacturing and mercantile classes.

THE ELECTION OF 1824. The conflict between the mercantile aristocracy of the Northeast, the agricultural aristocracy of the South, and the frontier democracy of the West was first manifest in the Presidential election of 1824. The three principal candidates, all members of the Democra-

tic-Republican Party, were John Quincy Adams of Massachusetts, representing the Conservative elements of the party; Andrew Jackson, born in South Carolina but at the time United States Senator from Tennessee, leader of the democratic Western frontier element and also of the border and Southern people; and Henry Clay, born in Virginia and at the time United States Representative from Kentucky and Speaker of the House, who was Jackson's rival for leadership of the West and South. After a bitter campaign no candidate had received the required majority of electoral votes, and the House of Representatives chose Adams as President, principally because Clay exerted his influence in Adams' favor. Because Jackson had received the plurality of electoral votes, his followers claimed that the election of Adams was contrary to the will of the people, and the Democratic-Republican Party split into two sections. One, the National-Republican Party, followed Adams and Clay; the other was led by Jackson, John Caldwell Calhoun of South Carolina, and William Harris Crawford of Georgia. During the administration of Adams the supporters of Jackson maintained a campaign of criticism of the President's policies, with the purpose of laying a foundation for the election of Jackson in 1828.

THE TARIFF AND NULLIFICATION. The principal controversy in the administration of Adams took place on the tariff question; see **TARIFFS, UNITED STATES.** The North favored a protective tariff. The South, which had advocated it in 1816, now opposed it. Since that year the exportation of cotton had so greatly increased (from 60,000,000 lb.

in 1816 to 200,000,000 in 1824) that the South had given up the idea of developing manufacturing industries in order to devote itself almost entirely to the cultivation of cotton. With no manufactures of its own that might benefit from a high tariff, the South objected to the high prices it would have to pay for manufactured goods under a high tariff. Southern leaders held that the levying of such a tariff taxed the economy of one section of the nation for the benefit of that of another section and asserted that this procedure was unconstitutional. The North, however, with its larger population, controlled Congress. In 1824, toward the close of Monroe's second administration, Congress passed a tariff raising the average duty from the 20 percent of the Tariff of 1816 to 36 percent; and in 1828, in Adams' administration, it passed a tariff levying even higher duties than those of 1824. The 1828 tariff, the so-called Tariff of Abominations, excited extreme anger in the South. Various Southern spokesmen reiterated their claim that the law was unconstitutional and reaffirmed their belief in the right of any State to refuse to obey any laws passed by Congress in excess of its Constitutional powers, as first laid down in the Kentucky Resolutions of 1798.

The South did nothing, however, during Adams' administration to implement its declared right to nullify acts of Congress, hoping that Jackson would be elected President in 1828 and would favor a low tariff. Jackson was elected over Adams in 1828, but he disappointed the hopes of the South by declaring that Congress was within its rights in levying a protective tariff; and in 1832 Congress passed a new tariff bill that was again highly protective in character. Indignation over the tariff immediately led to drastic action on the part of South Carolina. A convention summoned by the legislature of that State ordered its citizens not to pay the duties called for by the tariff law, and informed the Federal government that any attempt to enforce the law would be met by secession of the State from the Union. Jackson refused to be intimidated. He proclaimed that no State had the right to nullify a law of the U.S., and he threatened military action in South Carolina to enforce the Tariff of 1832. Military conflict between South Carolina and the Union seemed imminent, but the issue was settled by compromise. Congress passed a new tariff law providing for a gradual reduction of duties over a period of ten years until the rates were no higher than those of 1816; and South Carolina canceled its ordinance of nullification (q.v.).

JACKSON AND THE BANK. A violent sectional contro-

versy also took place in Jackson's first administration over the Second Bank of the United States, which had been established in 1816. Jackson was hostile to the Bank, charging that it unduly favored the commercial interests of the Northeastern States and was inimical to those of the State-chartered banks of the West. The West supported Jackson's point of view; the Northeast, and in general the National-Republicans, supported the Bank. Although the charter of the Bank was not to expire until 1836, in 1832 the Bank applied to Congress for a renewal of the charter. The application was a political maneuver on the part of Henry Clay, who expected Jackson to oppose the renewal and then to be repudiated by the people in the forthcoming election. Congress passed a bill granting the renewal and Jackson did veto it, but in the election of 1832, in which the Bank was the principal issue, Clay, candidate of the National-Republican Party, was overwhelmingly defeated by Jackson, who led the Democratic-Republicans. Jackson immediately moved to destroy the Bank, accomplishing his purpose by withdrawing Federal funds from the institution and depositing them in favored or "pet" State banks. In the administration of Jackson's successor, Martin van Buren, elected in 1836, Congress finally made the national government independent of the privately owned banking system of the country by the passage in 1840 of the Independent Treasury Act. The measure provided that government funds were thereafter to be deposited not in privately owned banks but in government subtreasuries created in important cities. The act was repealed in 1841, but a new measure with essentially the same provisions was passed in 1846.

THE WHIGS AND THE DEMOCRATS. The election and reelection of Jackson are generally regarded by historians as marking the first active participation by the entire American people in the government of the nation. Jackson, however, was an autocratic and arbitrary executive; he exercised such power over his cabinet and Congress that the period of his administrations is sometimes referred to as "the reign of Andrew Jackson". Between 1834 and 1836 his enemies, including the National-Republicans, Northerners whom he had offended by his action against the Bank, and Southerners whose enmity he had incurred by his stand against nullification in South Carolina, joined to create a new political party, the Whig Party (q.v.). At about this time also, the Democratic-Republicans, led by Jackson, dropped the second half of the party name and became the Democratic Party, still in existence



Frontier merchandising: "Yankee Peddler" (1853) by American artist John Whetten Ehninger (1827–89).

Newark Museum

today. The Democratic Party was strong enough to elect Van Buren in 1836 but fell a victim to the financial panic of 1837. Although the panic was engendered before Van Buren's administration and was brought about chiefly by over-speculation in land, canals, and railroads, the ensuing business depression lasted through Van Buren's administration and so discredited the Democrats that in 1840 the Whigs elected their candidate, William Henry Harrison. Harrison died, however, a few weeks after he was inaugurated in 1841, and the Vice-President, John Tyler, became President. The chief aims of the Whig Party, led by Clay, were to restore the Bank of the United States and to promote a high tariff. Tyler, however, had joined the Whigs not because of his belief in their political principles but because of his enmity toward Jackson. After Congress in 1841 passed a bill to recharter the Bank, Tyler vetoed it, whereupon he was read out of the Whig Party.

By this time, however, issues such as the tariff and the Bank, which had been the cause of sec-

tional controversy for two decades, had been superseded by a far more fundamental sectional issue, that of Negro slavery. The problem had already caused sharp controversy since the foundation of the nation, and from the fourth decade of the century to the middle of the sixth was destined to dominate all phases of American life.

The Crisis of Disunion. The first Negro slaves in North America were the twenty introduced into the Virginia Colony at Jamestown in 1619. During the 17th century about 25,000 Negroes were brought into the country, and slavery was legal in all the colonies. Climatic conditions were better suited to the Negro in the South than in the North; this fact and the demand for cheap labor to raise the principal Southern crop, cotton, caused a great increase in the number of slaves in the South toward the end of the 18th century, especially after the production of cotton was stimulated by the invention in 1793 of the cotton gin. The North gradually united in finding the institution of slavery obnoxious on both ethical and economic grounds, and by the end of the 18th century all the States north of Maryland, except New Jersey, had abolished

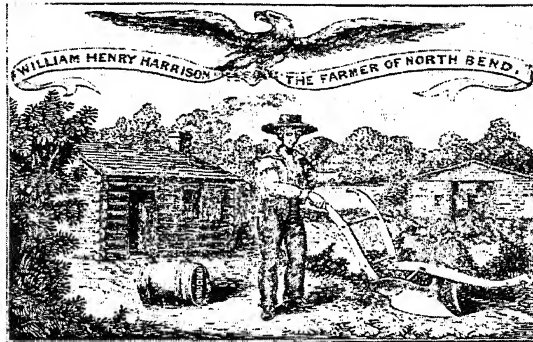
slavery. The Constitution of the United States, however, recognized the institution. Congress in its early days sometimes acted for and sometimes against slavery. By the Ordinance of 1787 it prohibited slavery in the Northwest Territory; in 1793 it passed the Fugitive Slave Law, which permitted a slaveowner to reclaim, from any locality in the U.S. and on mere proof of ownership, any slave who had escaped his custody (see FUGITIVE SLAVE LAWS); and in 1808 Congress forbade the further importation of slaves into the U.S. Between 1792 and 1812 the Union admitted four States in which slavery was legal, Kentucky, Tennessee, Mississippi, and Louisiana, and two in which slavery was prohibited, Vermont and Ohio.

The three sections of the country—North, South, and West—developed differing political attitudes, deriving largely from the socioeconomic patterns characteristic of each. The protective tariff and the national banking system were major issues. To ensure passage of national legislation favorable to their individual welfare, the factions struggled with one another for control of the Presidency and Congress. In the election of 1840 the Whigs glorified their candidate, William Henry Harrison, as a simple log-cabin frontiersman. Library of Congress

SLAVERY AND WESTERN EXPANSION (1820–50). Little opposition to the admission of the above-mentioned slave States had been made in Congress by members from Northern States. The first serious sectional controversy in Congress over slavery took place when the Missouri Territory, in which slavery was legal, applied for Statehood in 1818. The Missouri application for the first time aroused strong Northern opposition to the admission of a slave State. Because Missouri was to be the first State lying entirely west of the Mississippi to be made from territory added to the Union since its formation, the opponents of slavery felt its admission as a slave State would serve as a precedent for admission of all future States on a like basis. After a lengthy and violent

HARRISONIAN

BALL ROLLING.



KEEP THE

RALLY!

A General Meeting

Will be held at the OLD COURTROOM, [Riey's building]

On Saturday Evening,

The 18th instant, at early candle light. A punctual attendance is requested.

MESSRS. DAVIS, BOTKIN, KEATING

And others, will address the Meeting.

July 17, 1840.

R. P. TODD, *Chairman*
Vigilance Committee.

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controversy in Congress and throughout the country. Congress enacted the Missouri Compromise (q.v.). Under this law, Missouri was to be admitted as a slave State, but slavery was to be prohibited in all other States to be created out of territory of the Louisiana Purchase above 36°30' N. lat. Accordingly, Missouri was admitted into the Union in 1821; in the previous year, to placate the opponents of slavery, Maine, which had been part of Massachusetts since 1677 but desired separate Statehood, had been admitted as a free State.

The controversy over slavery preceding the enactment of the Missouri Compromise focused the attention of the entire country on the problem of slavery. In the North, after 1820, sentiment, based chiefly on ethical grounds, grew for the abolition of slavery, either gradually and with compensation for the slaveowner, or immediately and unconditionally. The South, feeling that the very basis of its economic and social order was threatened, passed stringent laws to keep its slaves under control; secured passage by Congress in 1840 of the so-called gag resolution, providing that Congress would no longer consider any petition presented it on the subject of slavery; tried unsuccessfully to shut out of the South the mail circulation of antislavery literature; and bitterly objected to Northern criticism of slavery. The division of national opinion on the slavery issue grew more violent through the third decade of the century and rose to a crisis in the fourth. That decade saw the acquisition by the U.S. of large new areas of territory in the West; at once a struggle began between North and South over the question of whether or not slavery should be permitted in those regions.

The new territory comprised Texas; the region known as Oregon; California; and New Mexico, which then consisted of the area between California on the west and Texas on the east, extending from the Mexican border to the southern border of Oregon.

TEXAS, OREGON, AND THE MEXICAN WAR. Texas was a province of Mexico in 1836 when its inhabitants, for the most part Americans who had settled there in large numbers since the beginning of the 19th century, successfully revolted against Mexico and established the Republic of Texas. The new nation desired annexation to the U.S. The South, openly favoring enlargement of the national territory in which slavery was permitted, strongly advocated the annexation of Texas, where slavery was legal; the North opposed the annexation. President Tyler favored annexation, but Congress refused to ratify the treaty of an-

nexation concluded between Texas and the U.S. by his secretary of state, John C. Calhoun. The question of the annexation of Texas then became involved with that of the annexation of Oregon. By virtue of exploration and settlement, both the U.S. and Great Britain claimed this region, which extended from lat. 42° N. and from the Rocky Mts. to the Pacific Ocean. Agreements had been made between the two nations in 1818 and 1828 to share authority over the region. In the 1840's strong sentiment arose in the U.S. for a division of Oregon that would give the U.S. undisputed possession of all of Oregon south of lat. 49° N.; some Americans insisted on the acquisition of all land south of 54°40'. The idea of annexing Oregon at this time was particularly favored by those who desired the annexation of Texas; they felt that by the addition of Oregon, in which slavery had taken no hold, the North might be won over to the annexation of Texas, a slave region.

The Presidential campaign of 1844 was fought largely on the issue of the annexation of Texas and Oregon. The Democrats favored the annexations; the Whigs took an indefinite stand, especially on the annexation of Texas. A third party also took the field in this campaign, the Liberty Party (q.v.), formed between 1837 and 1838, and standing for the abolition of slavery in the Southern States. The Liberty Party attracted enough Whig votes in New York and Michigan to give these two States and the election to the Democratic candidate, James K. Polk, a strong annexationist. Action on the annexations soon followed. In March, 1845, Texas was admitted to the Union; in June, 1846, Great Britain and the U.S. concluded a treaty extending the parallel of 49° N. lat., already the boundary between the U.S. and Canada east of the Rocky Mts., west from the Rockies to the Pacific, thus bringing under sole U.S. ownership all of Oregon south of the 49th parallel. See **NORTHWEST BOUNDARY DISPUTE**.

The annexation of Texas brought about a dispute between the U.S. and Mexico, which had never recognized the independence of Texas. Mexico, insisting that it still expected to subdue its rebellious province, in 1846 refused to discuss with the U.S. the question of the southern boundaries of Texas and a number of other controversial matters. Feeling grew strong in both countries; each massed troops along the Rio Grande, and a raid by Mexican troops into American-held territory led directly to war between Mexico and the U.S.; see **MEXICAN WAR**. In this war the U.S. was victorious. By terms of the Treaty of Guadalupe Hidalgo (Feb. 2, 1848),

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Mexico, in return for a sum of about \$15,000,000, ceded California and New Mexico to the U.S. and agreed to recognize the Rio Grande as the boundary between Texas and Mexico. In 1853 the U.S. purchased from Mexico an additional strip of territory, in southern Arizona; this acquisition, known as the Gadsden Purchase (q.v.), completed the western territorial expansion of the U.S.

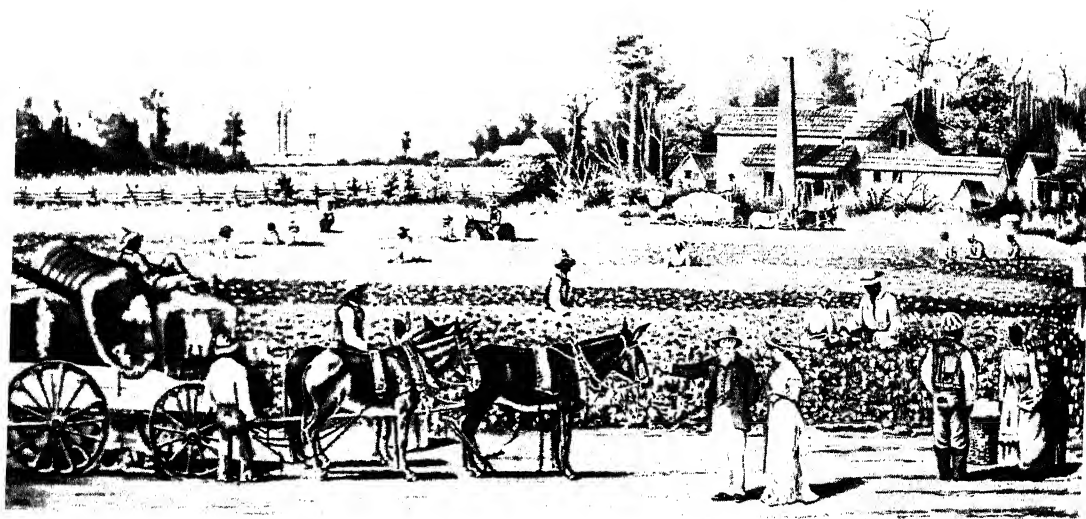
The struggle between South and North to introduce or prohibit slavery in the newly acquired regions had begun even before the peace treaty with Mexico was signed. To the appropriation bill for the expenses of the peace negotiations, David Wilmot (1814–68), a U.S. Representative from Pennsylvania, proposed in 1846 an amendment or proviso prohibiting slavery in any territory to be acquired from Mexico. The Wilmot Proviso (q.v.) was several times passed by the House but each time defeated by the Senate; even though it did not become a law, it served to crystallize and attract nationwide attention to the demands of the antislavery forces regarding the status of slavery in the

new territories. In retaliation, the slavery interests proposed for the bill organizing Oregon into a national territory an amendment permitting slavery therein; the amendment was defeated, and in 1848 Oregon became a territory in which slavery was prohibited.

CALIFORNIA AND NEW MEXICO. The next important controversy over slavery took place when President Polk in 1848 urged the civil organization of California and New Mexico, which had been under American military rule since 1846. Three plans were advanced in connection with the status of slavery in these areas: to permit slavery throughout California and New Mexico; to prohibit slavery throughout the two regions; or to divide each of the two into a free and a slave section by the parallel 36°30' N. lat., as all of the Louisiana Purchase except Missouri had been divided. The discussion over the slavery issue as it affected California and New Mexico became

The South and the North disagreed particularly over the issue of slavery and whether to allow or prohibit it in the newly opened West. The settlement of California, quickened by the discovery of gold in 1848, heightened the controversy.





Slavery meant plantation manpower. Should the practice be abolished, the South feared the collapse of its agrarian economy.

Library of Congress

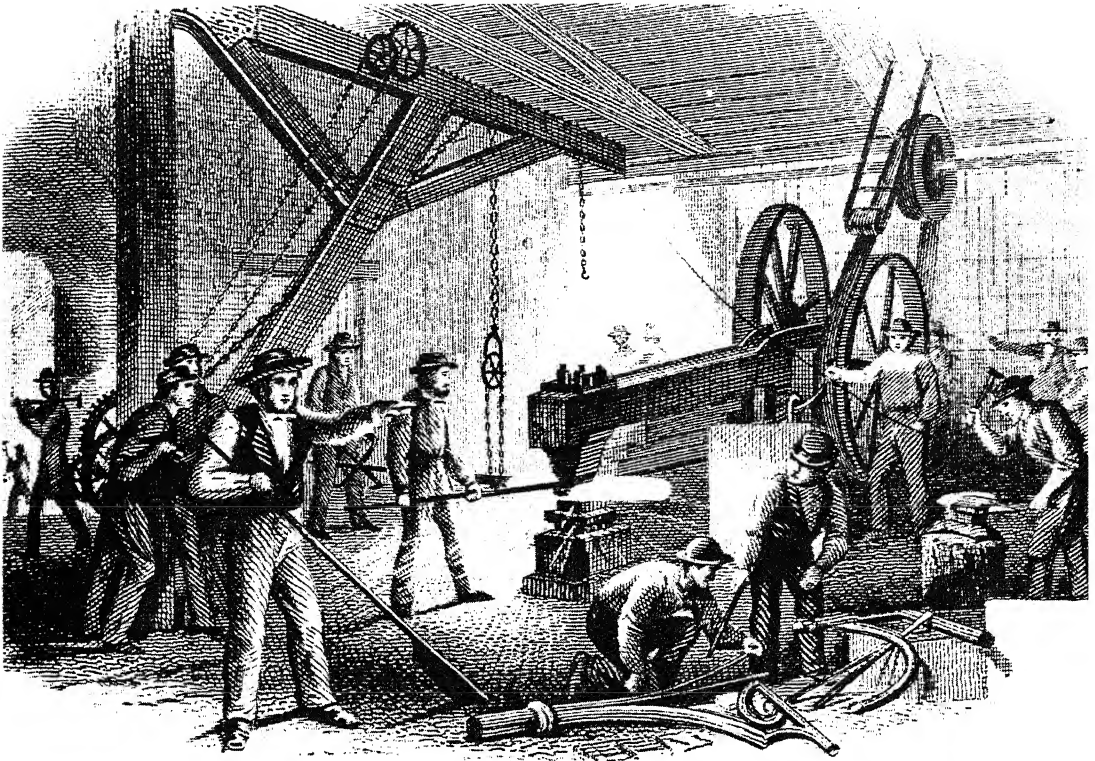
so acrimonious that in the Presidential election of 1848 the two principal political parties avoided committing themselves definitely on the issue. The Democratic candidate, Lewis Cass, advocated permitting each territory when it applied for statehood to determine for itself whether or not it wished to be slave or free; Cass's doctrine was known as "squatter sovereignty". The Whigs nominated General Zachary Taylor, a Southerner who had never urged the extension of slavery. The balance of power in the election was held by a new party, the Free-Soil Party (q.v.), to which most of the members of the Liberty Party had transferred their allegiance. The Free-Soil Party, like the Liberty Party, opposed slavery, but unlike the latter, which urged the abolition of slavery everywhere in the U.S., it opposed only the extension of slavery into the territory west of the Mississippi.

In the election of 1848 the Free-Soilers drew away a sufficient number of votes from the Democratic Party in New York State to enable Taylor to win the State and the election. In the

year following the election the slavery and anti-slavery groups in Congress proved to be so evenly divided that no solution to the problem of slavery in the newly acquired regions could be reached. At this juncture Henry Clay, in January, 1850, introduced the so-called Omnibus Bill, which proposed a series of compromises between the demands of the two groups. After a notable series of debates in the Senate from January to July, 1850, the propositions made by Clay were passed; in their enacted form they are known as the Compromise Measures of 1850 (q.v.). They provided principally for California to be admitted into the Union as a free State; for the entire region ceded by Mexico east of California to be opened to settlement by both slaveholders and antislavery advocates; and for a new Fugitive Slave Law, making much more effective the measures that could be taken by a slaveowner to reclaim an escaped slave.

For further information on topics discussed above see ABOLITIONISTS; AMERICAN ANTISLAVERY SOCIETY; NEGROES IN THE UNITED STATES; SLAVERY.

Slavery and the Preservation of the Union (1850-65). The passage of the Compromise Measures of 1850 was followed by a four-year



Manufacturing, not farming, was the business of the industrial North. Mills and factories were staffed by typical citizens—free and salaried. Northerners, for the most part, were opposed to the continuation of slavery.
 Bettmann Archive

truce in the slavery controversy. The belief grew throughout the country that the measures had permanently settled the problem of slavery. The Democratic Party in particular supported the compromise, and the overwhelming victory of the party in the Presidential election of 1852, in which Franklin Pierce of New Hampshire was elected, was regarded as a popular vote of confidence in the compromise. The one notable exception to its acceptance was the refusal of many people in the North to obey the Fugitive Slave Law and their persistence in helping fugitive slaves who reached the North to escape to Canada through secret routes known as the underground railroad (q.v.). The Northern abolitionists also kept up propaganda against slavery during the period of the truce; the novel *Uncle Tom's Cabin* (1852) by Harriet Beecher Stowe, in which the evils of slavery were sensationally presented, was particularly influential in creating sentiment against the institution. The years of the truce were marked by great commercial prosperity in the U.S. This was caused principally by the discovery in 1848 of gold in California; the growth in wheat production through the extension of wheat-planting in Iowa, which became a State in 1846, Wisconsin, which became a State in 1848, and Minnesota, which be-

came a territory in 1848; the increase of cotton production in the South and of manufactured goods in the North; and the rapid growth of railroads, which served to connect the northern Mississippi R. basin and the Eastern States. Despite general acceptance of the compromise, however, the controversy over slavery still smoldered, and in 1854 it sprang up again in a new form.

THE KANSAS-NEBRASKA ACT. In that year the question arose of the organization of the central part of the region acquired in 1803 through the Louisiana Purchase. In January, 1854, Stephen Arnold Douglas, U.S. Senator from Illinois and leader of the Democratic Party in the North, introduced the Kansas-Nebraska Act (q.v.), which provided that the people of the central part of the Louisiana Purchase be permitted to decide for themselves whether or not they desired slavery. The bill also provided that the region be divided into two sections, Nebraska to the north, in which slavery would probably be prohibited, and Kansas in the south, which would probably permit slavery. Because this division was in con-

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1820



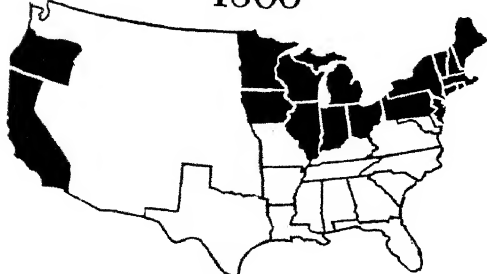
1845



1850



1860

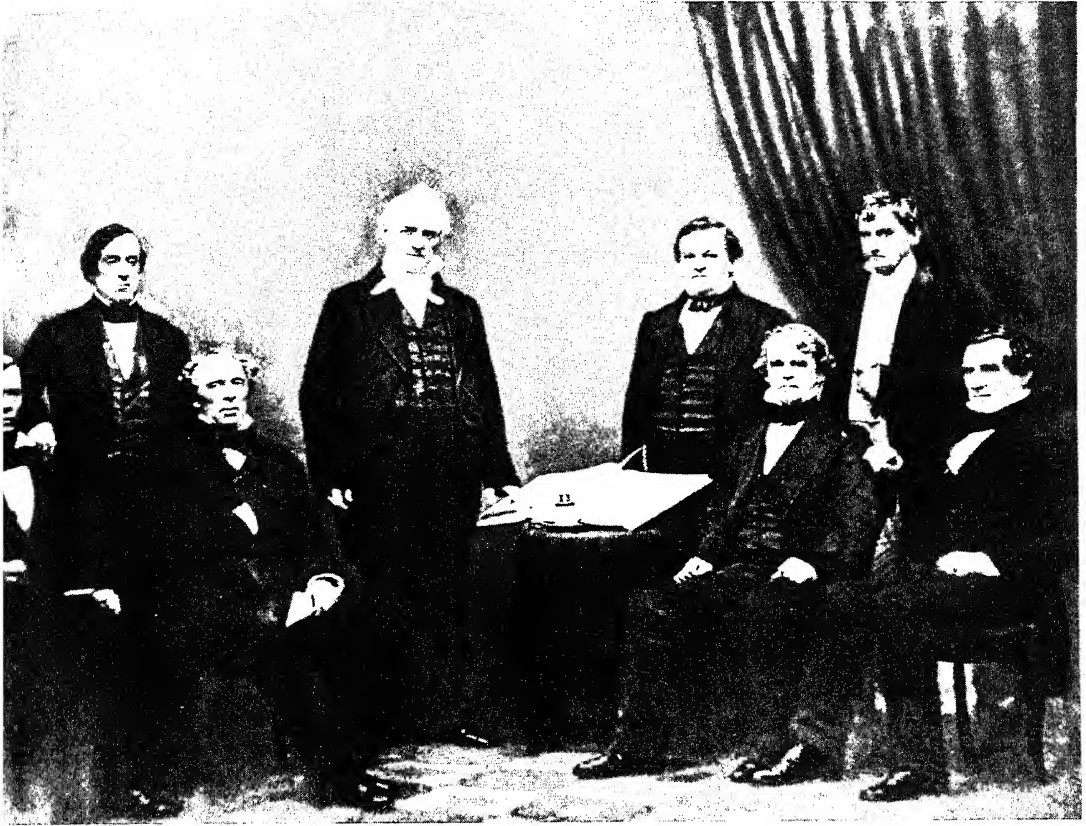


Background to Civil War. The maps dramatize the shifting balance of power between Free States (black area) and Slave States (gray area) in the United States from 1820 to 1860.

Graphics Institute

tradition to the Missouri Compromise, however, that law should be repealed.

In spite of opposition to the Kansas-Nebraska proposal in the North, where it was stated that Douglas had sponsored the extension of slavery into hitherto inviolable territory because of his desire to gain the support of the South for the Presidential nomination of the Democratic Party in 1856, the bill was passed in March, 1854. The Kansas-Nebraska Act aroused the bitterest criticism and opposition to slavery that had yet appeared in the North. It increased resistance to the Fugitive Slave Law; destroyed the Whig Party, whose Southern members were proslavery and whose Northern members were anti-slavery; and led directly to the formation of the Republican Party (q.v.) in Michigan on July 6, 1854. The founders of the party denounced slavery as an unmitigated evil and declared against its extension, and specifically demanded the repeal of the Kansas-Nebraska Act and the Fugitive Slave Law. The act also brought about conflict in Kansas, between abolitionist settlers who had emigrated from New England for the purpose of making Kansas a free State and proslavery forces who invaded Kansas from the neighboring slave State of Missouri. The abolitionists organized a government at Topeka and applied for admission to the Union as a free State. The proslavery forces sacked and burned the abolitionist town of Lawrence in May, 1856, and in retaliation John Brown, a fanatical abolitionist, led a group who killed five proslavery men at Pottawatomie Creek. Violent debate on the happenings in "bleeding Kansas" ensued in Congress. The Republican Party held its first national convention in 1856, and adopted a platform declaring against any further extension of slavery and nominating for President John C. Frémont of California and for Vice-President William Lewis Dayton (1807-64) of New Jersey. The nomination of men from free States for the two highest national offices brought threats from every part of the South that the States of that section would secede from the Union if Frémont and Dayton were elected. The Democratic Party nominated James Buchanan of Pennsylvania, a man of moderate views. The principal issue of the election of 1856 was the situation in Kansas. Realizing that the illegal control of the territory by proslavery elements from Missouri was alienating thousands of voters from the Democratic Party, President Pierce, who had up to then favored the proslavery government in Kansas, sent Federal troops there to eject the Missourians. Public sentiment then turned toward the Democrats, who succeeded



President James Buchanan, photographed with his cabinet, was confronted by a nation on the verge of civil war. He supported the right of a State to determine and manage its own affairs, yet at the same time stood square against secession. His attempts at compromise proved inadequate.

Library of Congress

in electing Buchanan. In its first national campaign, however, the Republican Party made a remarkably good showing.

President Buchanan hoped by a policy of compromise to end the agitation over the question of slavery, but events in his administration brought the issue to a final crisis. The South won two important victories in the controversy. The Dred Scott decision (see DRED SCOTT CASE) issued in 1857 by the U.S. Supreme Court, and the obiter dictum opinion of Chief Justice Roger B. Taney of Maryland sanctioned the institution of slavery by declaring that slaves were property and not citizens, and that Congress had no right to prohibit slavery in the territories. In December of the same year the proslavery element in Kansas managed by fraud to have the State adopt the proslavery Lecompton Constitution; and although a majority of the citizens of the territory opposed the constitution, President Buchanan recommended to the Senate that Kansas be admitted as a State under its provisions. The bill to bring this about was passed by the Senate but defeated by the House. (Kansas was finally admitted to the Union as a free State in 1861.) A series of debates in 1858 between the

two aspirants for the office of Senator from Illinois, Stephen A. Douglas and Abraham Lincoln, served to center the attention of the entire country as never before on the political and moral aspects of the problem of slavery. In these debates Douglas advocated popular sovereignty in the territories; Lincoln stood for Congressional control of slavery in the territories. Douglas won the election, but the debates established Lincoln as the leader of the Republican Party in the West.

The South now was no longer satisfied with the doctrine of popular sovereignty; Southern leaders demanded, in resolutions presented to the Senate in February, 1860, that Congress protect slavery wherever it existed in the country. The resolutions did not pass, but they served as the platform demanded by the Southern wing of the Democratic Party in its convention of 1860, held in April at Charleston, S.C. The convention split on the slavery issue. The group led

by Douglas won the adoption of a platform advocating popular sovereignty in the territories, whereupon the Southern group bolted the convention. In June the regular Democrats nominated Douglas; the Southern wing nominated John C. Breckinridge of Kentucky. The Republicans, with a platform hostile to slavery in the territories, nominated Abraham Lincoln. A fourth party, the Constitutional Union Party (q.v.), took no position on slavery declaring only for the Constitution, the Union, and law enforcement; its candidate was John Bell of Tennessee. The election was won by Lincoln, although he received less than 40 percent of the popular vote.

SECESSION AND WAR. The election of 1860 proved that the commanding position in national affairs now belonged to the North, and the South felt that thenceforth all important economic and social issues would be settled according to the principles and needs of the North. The South was especially fearful for the future of slavery. Although the Republican Party declared it had no intention of interfering with slavery in the Southern States, the South considered there was nothing to prevent the party from coming under the control of abolitionists intent on eliminating slavery from the Union. The election convinced the leaders of the South that thereafter the welfare of their section would not be satisfactorily

Northern citizens tried to thwart the despised Fugitive Slave Law authorizing the capture, detention, and return of runaway slaves who had escaped to the free States. Slavery and its political ramification, popular sovereignty or States' Rights, hopelessly polarized the nation.

CAUTION!!

COLORED PEOPLE

OF BOSTON, ONE & ALL,

You are hereby respectfully CAUTIONED and advised, to avoid conversing with the

Watchmen and Police Officers of Boston,

For since the recent ORDER OF THE MAYOR & ALDERMEN, they are empowered to act as

KIDNAPPERS

AND

Slave Catchers,

And they have already been actually employed in KIDNAPPING, CATCHING, AND KEEPING SLAVES. Therefore, if you value your LIBERTY, and the Welfare of the Fugitives among you, ~~Shun~~ them in every possible manner, as so many HOUNDS on the track of the most unfortunate of your race.

Keep a Sharp Look Out for
KIDNAPPERS, and have
TOP EYE open.

APRIL 24, 1851.

UNITED STATES OF AMERICA. THE

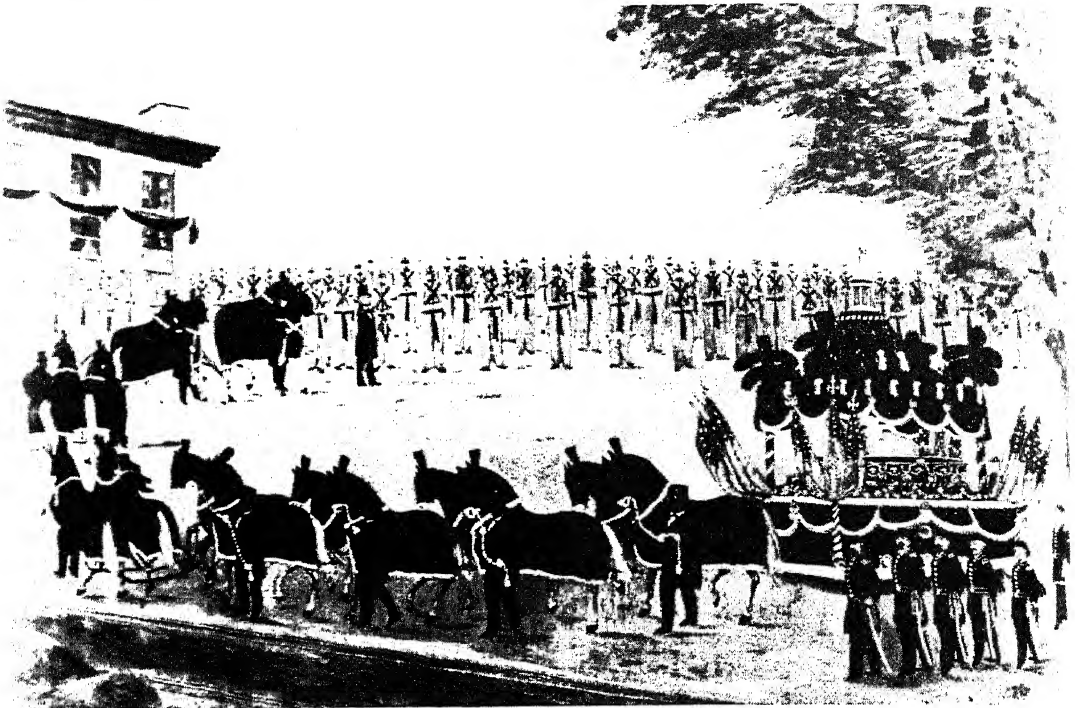
The election of 1860 brought the Republican candidate Abraham Lincoln (right) to the Presidency. Lincoln had campaigned on a platform opposing slavery in the territories. His election convinced Southern leaders that the future of slavery, and perhaps other Southern interests, was in jeopardy. Eleven States seceded from the Union—the Confederate States of America; and Civil War began. A major Confederate invasion of the North was stopped at Gettysburg (below) in 1863. The war continued, however, a grim reality for two more years.



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"President Abraham Lincoln's Funeral Procession", famed American Primitive painting dated 1870 and signed by an unknown artist S. F. Milton.

Galerie St. Etienne

conserved while the Southern States remained a part of the Federal Union, and they immediately acted to withdraw from the Union. On Dec. 20, 1860, by action of the convention called by the State legislature, South Carolina seceded from the Union, and a few days later military forces of the State laid siege to the Federal garrison at Fort Sumter in the Charleston harbor. The example of South Carolina was followed within a month by Mississippi, Florida, Alabama, and Georgia, and later by Louisiana, Texas, Virginia, Arkansas, North Carolina, and Tennessee.

On Feb. 4, 1861, delegates from six of the seceding States met at Montgomery, Ala., and formed a provisional government under the title of the Confederate States of America (q.v.). A number of attempts were made to resolve by compromise the issues that were steadily driving North and South to war, but they failed. Lincoln, in his inaugural address on March 4, 1861, made his position clear: he did not intend to interfere with slavery in the States where it existed; at the same time he declared that no State had the right to leave the Union as and when it pleased. On April 12, the besiegers of Fort Sumter began a bombardment of the fort, which surrendered two days later. On April 15, Lincoln

called upon the loyal States for 75,000 volunteers to serve for three months. The American Civil War, sometimes also known as the War between the States or the War of Secession, had begun. For a detailed account of the military operations of the war, see CIVIL WAR, THE AMERICAN. **Reunion and Industrialization.** The Civil War settled the two great problems that had been agitating the nation almost since its foundation. Permanent union on the basis of the supremacy of the nation over the States was assured by the victory of the North; and although the war was fought primarily to preserve the Union on this basis, as the conflict proceeded, the North also included in its war aims the abolition of slavery. By a number of acts passed during 1861 and 1862, Congress abolished slavery in the national domain. On Jan. 1, 1863, President Lincoln issued the Emancipation Proclamation (q.v.), which declared free all the slaves in the rebellious States; and on Dec. 18, 1865, the Thirteenth Amendment to the Constitution, forever abolishing slavery in the States and Territories of the U.S., was declared ratified.

SUPREMACY OF THE REPUBLICAN PARTY (1865-85). The first twenty years of the period were marked by the dominance of the Republican Party in the affairs of the nation. All the Presidents of this period were Republican: Andrew Johnson (1865-69), Ulysses S. Grant (1869-77), and Ches-

ter A. Arthur (1881–85). The Republican Party, during the years 1854 to 1865, had been controlled on the whole by men with humanitarian political aims; in its second decade it was dominated by businessmen and politicians whose purpose was to extract personal financial profit by controlling or associating with government. *Reconstruction.* The first great problem that the nation, under Republican leadership, faced after the conclusion of the Civil War, was that of devising some means of bringing the seceded States back into the Union. The question, which had emerged even during the war, at once became a matter of contention between the President and the Congress. Lincoln's plan for Reconstruction (q.v.) of the Southern States was to readmit them on liberal and easy terms; the conditions that Congress wished to impose were much more severe. Andrew Johnson, who became President after the assassination of Lincoln on April 14, 1865, had views on Reconstruction similar to those of Lincoln, but his attempt to put them into effect without consulting Congress brought about a series of bitter disputes between the executive and legislative branches of the national government. The quarrel was won by Congress, which passed over the President's veto its own plan, the Reconstruction Acts of 1867. By this plan most of the South was divided into five military districts, each supervised by a Union major general in command of a detachment of troops. Suffrage was granted the Negro population; and by the third section of the Fourteenth Amendment (adopted 1868) of the Constitution, the former political leaders of the South were denied participation in the various State governments set up by the Reconstruction Acts. The result was that these governments came into the control of former Negro slaves; uneducated, politically immature, this element was largely under the influence of adventurers, known as carpetbaggers (q.v.), who had flocked to the South to gain money and power and befriend the Negroes.

The so-called carpetbag State governments in the South were kept in power by Federal troops and invariably elected Republican representatives and Presidential electors; the legislatures and executives extravagantly expended the State income, and millions went to carpetbaggers in the form of graft. The economic and social evils inflicted upon the white population by these governments provoked underground rebellion, principally by the secret society known as the Ku-Klux Klan (q.v.). Political action also resulted, which finally, by about 1874, returned the State governments of the South largely to

the control of white Southerners. The injuries inflicted upon the South by the drastic Reconstruction measures of the Republican Party engendered in the South a bitter animosity toward that party and the North.

Influence of Big Business. Republican rule during the first two decades after the Civil War not only inflicted serious economic injury upon the South, but also, because of the alliance between financial interests and the Republican Party machine, resulted in a period of unparalleled government favoritism to big business. For example, government policy under Republican control unduly favored the organizers of new railroad enterprises in the West. In 1862 Congress chartered five railroads in the Far West, and it subsequently granted these railroads large loans and huge tracts of Far Western territory; the Northern Pacific R.R. alone received 47,000,000 acres of land. Also during this period, a series of frauds took place, notably during the administration of President Grant; see WHISKEY RING. Unscrupulous politicians in alliance with corrupt businessmen looted both the public treasury and the public domain. By the Homestead Act of 1862 (see HOMESTEAD LAWS), intended to encourage Western migration, the government gave 160 acres of land free to any head of a family who contracted to cultivate the tract for five years; millions of acres, however, came fraudulently into the hands of so-called land sharks. Even the epoch-making achievement of building the 1800-mi. railroad from the Missouri R. to the Pacific Coast (finished on May 10, 1869), which completed the first American transcontinental railroad route, was tainted with fraud; see CRÉDIT MOBILIER OF AMERICA.

Reform Movements. In moves to counter this state of affairs, a dissident group within the Republican Party, called the "Liberal Republicans", initiated (1870–72) a movement to bring about civil-service reform, to reduce the protective tariff that was causing high prices, and to withdraw the Federal troops upholding the Negro Republican State governments in the South; the group also condemned the contemporary corruption in the national government. In the election of 1872 the Liberal Republicans nominated the newspaper editor Horace Greeley for President, but although he also was the nominee of the Democratic Party, he was defeated by Grant, the Republican candidate. Outside the party a strong protest movement against the economic burdens imposed on the agricultural classes of the West and elsewhere by the railroads, particularly in the form of high freight rates charged to carry crops and supplies, arose



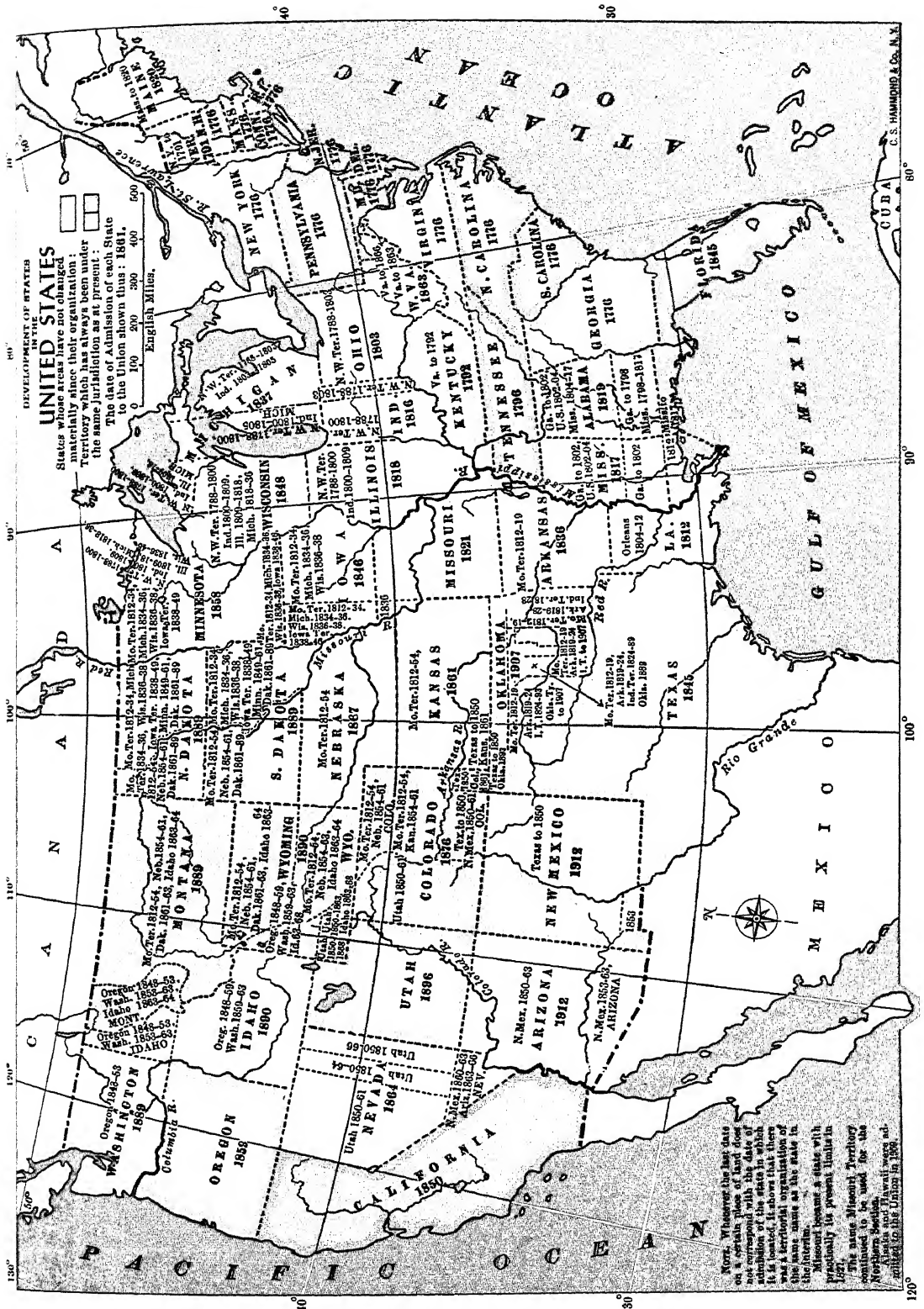
Postwar administrations favored big business. The last lap of the first cross-country railroad—an 1800-mi. span—was completed in 1869. Union Pacific Railroad

among American farmers; see GRANGE, NATIONAL; GRANGER MOVEMENT. A movement to reform labor conditions and to bring about currency reforms that would make more money available to the debtor classes, particularly the farmers who owed money to banks and the price of whose products was declining in the 1870's, resulted in the formation of the Greenback Party, later the Greenback-Labor Party (qq.v.); the Greenback Party in 1876 nominated the philanthropist Peter Cooper for President, but he received no electoral votes. The election of 1876 was won by the Republican Rutherford B. Hayes after a bitter struggle with his Democratic opponent Samuel Jones Tilden; see ELECTORAL COMMISSION OF 1877. Hayes was not a machine politician, and his administration was marked by efforts on his part to inaugurate various reforms, all of which were opposed by most of the other leaders in the party. For instance, he withdrew the Federal troops still supporting carpetbag governments in the South (in Louisiana and South Carolina), even though his action meant that the governments of these States would immediately come under the control of the Democratic Party. The administration of Hayes was also notable for two financial measures. One was the Bland-Allison Act of 1878 by which, in answer to the de-

mands of Western silver-mine owners who desired a market for their product, and of Western farmers and others who desired an increased amount of currency in circulation, the U.S. government agreed to purchase at least \$24,000,000 worth of silver annually from the miners and to coin the supply into silver dollars. The second was the resumption by the United States Treasury in 1879 of specie payment, that is, payments in gold for outstanding paper money; such payments, suspended during the Civil War, increased faith in the credit of the U.S.

Largely because of his opposition to the Republican machine, Hayes was not renominated by the Republican convention of 1880. At the convention, however, an inconclusive contest between the two machine candidates, Grant and James G. Blaine, led to the nomination of a compromise candidate, James A. Garfield. Garfield was elected over the Democratic candidate, Winfield S. Hancock (1824-86), and, once in office, he opposed the Republican machine leaders, principally by refusing to make Federal appointments according to their orders. On July 2, 1881, Garfield was shot by a disappointed office-seeker, Charles J. Guiteau (1840?-82), and died on Sept. 19; he was succeeded by the Vice-President, Chester A. Arthur, who was faithful to the party machine.

REEMERGENCE OF THE DEMOCRATIC PARTY. During Arthur's administration, several off-year elections



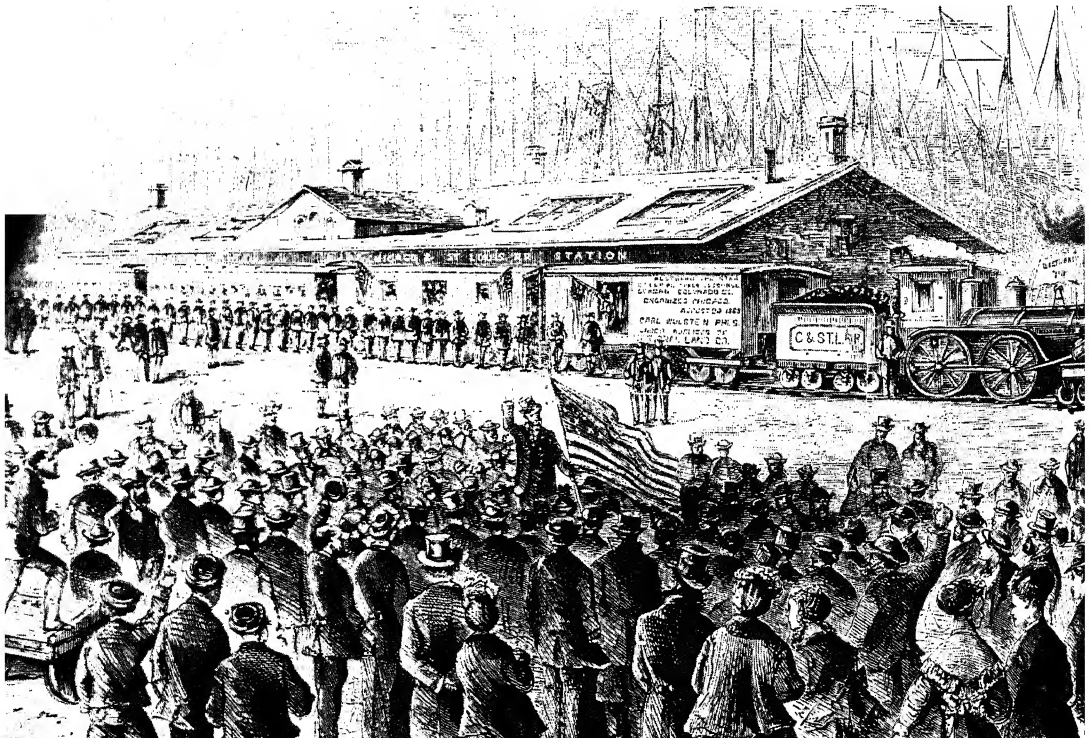
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in which the Democratic Party won important State offices served as warning to the Republican Party of the growing dissatisfaction in the nation with its partisan policies. Notable among these Democratic victories was the election of Grover Cleveland as governor of New York. The party sought to placate this dissatisfaction by passing in 1883 a civil-service reform bill (see CIVIL SERVICE), but national feeling had so turned against the Republican Party by 1884 that for the first time since 1856 the Democrats elected a President. Grover Cleveland defeated the Republican nominee, James G. Blaine, after a campaign remarkable for the rancor with which the two parties attacked each other; see MUGWUMPS. **Domestic Affairs (1885–1901).** President Cleveland in his first administration (1885–89) was confronted with five major domestic problems, involving the Federal civil service, Federal pensions, labor unrest, abuses in the business methods of the railroads, and the Treasury surplus and the tariff.

Although Cleveland was a strong advocate of a Federal civil service with appointments based on merit, the demand of Democratic Party leaders for Federal jobs led him to agree to numerous arbitrary removals of officeholders and to replacements made on the basis of service to the Democratic Party; however, he did add

12,000 positions to the group already on a merit basis. The administration was marked by numerous private pension bills passed by Congress, chiefly in favor of veterans of the Civil War who could not get on the regular pension rolls; Cleveland vetoed more than 200 of these bills. **THE BEGINNINGS OF THE LABOR MOVEMENT.** Cleveland's administration was also noted for the emergence in the U.S. of labor as an organized economic and political force. Trade unions were formed on a national scale between 1861 and 1866; and the first attempt to unite all trade unions into one federation took place in 1866 with the organization of the National Labor Union (see TRADE UNIONS IN THE UNITED STATES), which was disbanded in 1872 because of internal strife. It was succeeded by the Knights of Labor (see KNIGHTS OF LABOR, THE NOBLE ORDER OF THE), organized in 1869. By 1886 this body was a national organization with more than 700,000 members. Its policy was to demand of State and national governments laws to ameliorate injustices inflicted on the working class by contemporary economic conditions and practices. In Cleveland's administration labor for the first time in the U.S. made vigorous claims, through demands for higher wages and shorter hours, to a larger share of the national income than it had previously enjoyed. Such demands resulted in unprecedented conflict between capital and labor; in 1886 and 1887 more than 3000 strikes took place in the U.S. The strike at the McCor-

The railroad eased and shortened the journey West. Colonies of emigrants left to settle mining towns in the new States.
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mick Reaper Works, Chicago, occasioned the notorious Haymarket Square Riot (q.v.), which aroused violent controversy throughout the nation.

RAILROAD REGULATION. In Cleveland's administration also, much criticism was directed at the railroads, which had practically a monopoly of freight transportation on Western routes and practiced extortion and discrimination in the making of freight rates. In 1887, as the result of agitation for Federal control of the railroads, the U.S. Congress passed the Interstate Commerce Act (q.v.) to regulate railroads, establishing a precedent for the future for similar regulation of railroads and other interstate commercial enterprises.

THE TARIFF AGAIN. The principal question of importance in Cleveland's administration was, however, the tariff. On taking office, the President found a surplus of nearly \$500,000,000 in the Treasury; this sum had accumulated because of the high protective tariffs that had prevailed since the Civil War. Cleveland felt that it was in the interest of consumers and taxpayers to bring about a reduction in the tariff; such a reduction would discourage Congress from making extravagant appropriations and would also lower prices on many commonly used commodities. Through his influence, the House of Representatives passed a bill reducing the tariff by 7 to 8 percent; but the bill was not passed in the Senate. The tariff was the principal issue of the Presidential campaign of 1888. By making it appear that Cleveland, who actually was a proponent only of a low tariff, favored a free-trade policy that would enable British manufacturers to undersell U.S. manufacturers in the U.S. market, the Republican Party brought about the election of its nominee, Benjamin Harrison.

THE HARRISON ADMINISTRATION. Harrison's administration witnessed a reversal of the financial policies of Grover Cleveland. Congress disposed of the Treasury surplus by making large appropriations for pensions, naval vessels, lighthouses, coast defenses, and other projects. It also passed the McKinley Tariff Bill, which raised the already high protective duties and resulted in higher prices for many household commodities. In order to gain the support of the West for the bill, Congress in 1890 passed the Sherman Silver Purchase Act, by which the government agreed to buy 4,500,000 oz. of silver every month and to issue paper money equaling the full amount purchased. Harrison's administration also saw the passage in 1890 of the Sherman Antitrust Act (q.v.), which declared illegal "every contract, combination in the form of trust or otherwise,



Dissatisfaction with the partisan policies of the post-war administrations grew. In 1880 political cartoonists suggested the Democrats might "walk over" the "sluggish" Republican Party.

or conspiracy in restraint of trade". Although the nation favored this measure, it reacted against the higher prices brought about by the McKinley Bill by electing a Democratic Congress in 1890. In 1892 a Democratic President, Grover Cleveland, won his second term. A feature of the campaign was the emergence of a new political party, the People's Party (q.v.), usually known as the Populist Party, formed principally by Western farmers and workers who were members of the National Farmers' Alliance (see FARMERS' ALLIANCES) or of the American Federation of Labor (q.v.). The People's Party nominee for President, James B. Weaver (1833-1912) of Iowa, ran on a platform that included demands for the free coinage of silver, government ownership of important utilities,

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and election of U.S. Senators by popular vote. THE SECOND CLEVELAND ADMINISTRATION. Cleveland's second administration was one of increasing conflict between the interests of the laboring classes, whose most radical supporters lived in the West, and those of the large bankers and manufacturers of the country, the seat of whose enterprises was generally in the East. Those who expected Cleveland and his solidly Democratic Congress to effect financial and economic reforms demanded by the West suffered disappointment. Although pledged to a tariff for revenue only, through the efforts of Senators devoted to protecting the interests of large corporations or trusts (q.v.), Congress passed another high protective tariff; and the U.S. Supreme Court declared unconstitutional the income-tax law that had been much stiffened in 1894 and the burdens of which fell on the comparatively well-to-do. In addition to legislation and judicial decision that displeased the West, the administration saw a period of industrial depression, high prices, widespread unemployment, lockouts, and strikes. The most important strike was that in 1894 of the employees of the Pullman Palace Car Company, who were led by the American Railway Union. The strike, to prevent wage cuts, resulted in violence, destruction of property, the sending by President Cleveland of Federal troops to keep order in Chicago, the breaking of the strike by Federal injunction, the imprisonment of a number of strike leaders, including the noted labor leader Eugene V. Debs, and increasing discontent with the administration on the part of the working classes, particularly the Populists and the radicals among the Democrats. This dissatisfaction found expression at the Democratic convention of 1896. Dominated by the radical elements of the West, the convention issued a platform demanding, among other things, the free and unlimited coinage of silver at the ratio of 16 to 1 (see BIMETALLISM), and an end to government by Federal injunction, as in the Pullman strike. The Democrats nominated William Jennings Bryan for President; the Republicans, William McKinley. The chief issue of the campaign, in which the economic interests of West and East were sharply opposed, was the silver question. After a strenuous contest, McKinley defeated Bryan.

THE MCKINLEY ADMINISTRATIONS. The principal event of McKinley's first administration was the Spanish-American War (see below, *Foreign Affairs, 1865-1920*). Among the results of the American victory in the war was the acquisition by the U.S. of the Philippine Islands as well as other territories not part of the North American

continent. Expansion of the nation to include such regions was denounced as imperialism (q.v.) by the Democratic Party, and became the principal issue of the Presidential campaign of 1900. The nation, however, supported the policy of expansion as carried out by the McKinley administration; in the election McKinley again defeated Bryan, this time by a popular majority of almost 1,000,000, and 292 electoral votes to 155. In September, 1901, McKinley was assassinated by a crazed anarchist, and Vice-President Theodore Roosevelt became President. His administrations marked a new attitude on the part of a section of the Republican Party toward the important social, political, and economic questions of the time, and led gradually to a sharp split in the party.

Theodore Roosevelt and Progressivism (1901-12). Theodore Roosevelt, like Jackson and Lincoln, believed that it was the duty of the President to initiate, and cause to be implemented by Congress, a policy of social and economic benefit to the people at large. The policies of Roosevelt designed to secure a greater measure of social justice in the U.S. were outlined by his first message to Congress, delivered on Dec. 3, 1901, which included demands for Federal supervision and regulation of all interstate corporations; for amendment of the Interstate Commerce Act to prohibit railroads from giving special rates to shippers; for the conservation of natural resources; for Federal appropriations for irrigation of arid regions in the West; and for extension of the merit system in civil service. President Roosevelt was particularly noted for his policy regarding the type of business combination known as a trust. The number of trusts in the U.S. had increased greatly at the turn of the 19th century; only sixty had existed in the U.S. prior to the Spanish-American War, whereas 183 were formed between 1899 and 1901. Roosevelt recognized the right of such combinations to exist, even though many of them had practical monopolies of vital commodities such as oil, beef, coal, and sugar, or of important utilities, such as the railroads; but Roosevelt also insisted on the right of the government to control and regulate the trusts. At his urging, Congress passed several measures designed to help enforce the antitrust laws already on the statute books; among the new laws were the Elkins Act (1903) and the Hepburn Act (1906), aimed respectively at the discriminatory practice of secret rebates given by various railroads to certain shippers, and at strengthening the Interstate Commerce Commission (q.v.) in its authority over railroads and other public carriers. During



President Teddy Roosevelt, shown leading a volunteer regiment during the Spanish-American War of 1898, made vigorous use of his executive powers to solve national problems.

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his administrations (after completing McKinley's administration, he was elected in 1904), the Department of Justice instituted forty-three suits against the trusts and in several won important judicial decisions, including one ordering the dissolution of the Standard Oil Company (q.v.) of New Jersey as a holding company with a monopoly of oil refining.

Other important domestic reforms initiated by President Roosevelt included the creation of forest reserves and national parks; the appointment of the National Conservation Commission in 1908 to promote further conservation; and the passage of the Meat Inspection Act and the Pure Food and Drugs Act following a Federal investigation of packing-house conditions prompted by revelations made in the novel *The Jungle* by Upton Sinclair. Roosevelt became a figure of worldwide importance through the vigor and dramatic quality of his actions and speeches as President, his inauguration of the building of the Panama Canal (see below, *Foreign Affairs, 1865-1920*), and his activities in ending the Russo-Japanese War (q.v.). He declined to be a candidate for reelection in 1908, and on his recommendation his secretary of war, William Howard Taft, was nominated by the Republican Party. Taft easily defeated his Democratic opponent, William Jennings Bryan.

The Republican platform of 1908, like the De-

mocratic platform of the same year, called for a downward revision of the tariff; but the Payne-Aldrich Bill, which the Taft administration sponsored and had passed in 1909, was still a high protective tariff. Over the tariff questions and other issues a pronounced split developed in the Republican Party during Taft's administration. On one side were the conservative element, the so-called standpatters, who wanted a high tariff and opposed the kind of reforms initiated by Roosevelt; on the other were the so-called insurgents, later known as progressives, who denounced the high rates of the Payne-Aldrich tariff as a betrayal of the promises made in the Republican platform and criticized the administration for refusing to continue the reforms begun by Roosevelt. Former President Roosevelt openly sided with the progressives; he gave his support not only to tariff revision, but also to such political and economic reforms as direct primaries (see *ELECTIONS: Primary Elections*), the recall, and an income tax (qq.v.).

In January, 1911, the National Republican Progressive League was organized by the Republican Senator from Wisconsin, Robert M. La Follette, to take political action for the principles of



In the first three decades of the 20th century, nearly 19,000,000 immigrants came to the U.S. Farmers, reluctant to share the land with the new arrivals, and labor, angered by the lower wages paid to immigrant workers, lobbied for immigration controls. A quota system was set up sharply restricting the number of aliens from each country. Lewis Hine-

George Eastman House

the progressive element in the Republican Party. By 1912 the progressives had elected several governors in Western States. Standpatters and progressive Republicans engaged in a bitter battle for control of the Republican national convention of June, 1912. Defeated in their efforts to seat their delegates, the progressives, led by Roosevelt, bolted the convention and in August organized the Progressive Party (q.v.), popularly known as the Bull Moose Party, and nominated Roosevelt for President and Senator Hiram Johnson of California for Vice-President. The regular Republican convention had nominated Taft, and the Democratic Party nominated Governor Woodrow Wilson of New Jersey. Because of the split in the Republican ranks, Wilson won decisively.

Wilson and the New Freedom (1912-20).

Woodrow Wilson, like Roosevelt, believed that the Presidential office should be used for initiating and guiding national legislation in accordance with the chief executive's interpretation of the will of the people. He announced in his inaugural address his dedication to the task of improving the national life in all possible aspects. Wilson's social, economic, and political policies as a unit are sometimes known as "The New Freedom", from the title of a volume by him published in 1913 and containing significant passages from his addresses in the campaign of 1912. Displaying unusual executive

ability and skillful control of his cabinet and Congress, during his two terms (he was re-elected in 1916), he succeeded in carrying out notable revisions and reforms in the laws governing the tariff, the banking system, trusts, labor, and agriculture.

Under his guidance and urging, Congress in 1913 passed a new tariff bill, the Underwood-Simmons Bill, which provided for a general decrease in the schedules of the Payne-Aldrich tariff, and for an income tax to bring in sufficient revenue to compensate for any loss in national revenue occasioned by the lower tariff duties. To provide the means for furnishing an elastic currency, that is, one that could be readily expanded or contracted to suit the national need, and to establish more effective general supervision of banking than existed at the time, Wilson took active part in the passage by Congress of the Federal Reserve Act of 1913, which resulted in the organization of the Federal Reserve System (q.v.). Wilson, who considered private monopoly "indefensible and intolerable", also prevailed on Congress in 1914 to pass two important pieces of legislation in regard to trusts. One established the Federal Trade Commission (q.v.) to investigate and prevent unfair methods of business competition; the second was the Clayton Antitrust Act (q.v.), designed primarily to punish those guilty of employing such unfair methods. The Clayton Act also ex-

empted from the provisions of the antitrust laws all labor unions and agricultural associations; prohibited in most instances the use of the injunction in labor disputes; and laid down the principle that strikes, peaceful picketing, and boycotts do not violate the Federal laws. Other measures to protect labor passed during Wilson's administration include the La Follette Seamen's Act, which regulated working conditions for seamen on American ships; a law providing an eight-hour working day for railroad workers on interstate lines; and a law prohibiting child labor (q.v.) under certain conditions. To provide easier credit for farmers, the Wilson administration established, by means of the Federal Farm Loan Act of 1916, twelve Federal land banks to make long-term loans at reasonable rates on long-term farm mortgages.

The most important issues of Wilson's first and second terms, however, were those arising from World War I, which had broken out in Europe in 1914, the entrance of the U.S. into the war in 1917, and the making of peace in 1919. For discussion of these issues, see below.

Foreign Affairs (1865–1920). The period included in the following summary of the foreign relations of the U.S. may be divided into three parts. In the first, from 1865 to 1898, American foreign policy was determined principally by the attitudes and actions of foreign governments in regard to the U.S. American foreign policy during these three decades was strongly nationalistic; it did not concern itself with world issues, nor did it enable the U.S. to play an important part in world affairs. As a result of the Spanish-American War in 1898, however, the U.S. acquired territorial possessions outside its continental area, giving the nation problems of colonial government and control that, together with other factors, compelled it to assume an increasing role in world affairs. From 1914 to 1920 American foreign policy was concerned chiefly with World War I. The outbreak of the war in Europe brought a period of diplomatic conflict between the U.S. and Great Britain and Germany, respectively; in 1917 the U.S. was finally drawn into the war against Germany and its allies. The U.S. played a prominent part in the writing of the Treaty of Versailles, which ended the war in 1919. The rejection by the United States Senate of the treaty and of American entrance into the League of Nations, the covenant for which formed part of the treaty, for the time being reversed the tendency toward U.S. involvement in world affairs.

THE INFLUENCE OF FOREIGN GOVERNMENTS (1865–98). During the American Civil War, both France and

Great Britain sought to profit by the preoccupation of the Federal government with its conflict with the South. Napoleon III of France, ignoring the protests of the U.S. Department of State that he was violating the Monroe Doctrine, in 1863 made Maximilian, Archduke of Austria, the emperor of Mexico, and in 1864 supported with French troops Maximilian's invasion of Mexico. After the close of the Civil War, however, more vigorous objection on the part of the U.S. resulted in the withdrawal in 1867 of the French forces supporting Maximilian, the subsequent loss by Maximilian of his throne, and his execution by rebellious subjects. Great Britain during the Civil War had permitted, in violation of international law, construction in British shipyards of Confederate cruisers, which inflicted severe losses upon Northern shipping. The U.S. sought damages from Great Britain to compensate for the losses caused by the Confederate ships, particularly the cruiser *Alabama*; see **ALABAMA CLAIMS**. In contrast to the attitudes of France and Great Britain during the Civil War, that of Russia was one of friendliness to the U.S. The amicable Russo-American relations of the period led in 1867 to the purchase by the U.S. from Russia of Alaska, then known as Russian America; for the 577,390 sq.mi. of territory comprising Alaska the U.S. paid \$7,200,000 in gold.

The last quarter of the 19th century also witnessed a number of disputes between the U.S. and Great Britain: the Bering Sea Controversy (q.v.); a dispute over American fishing rights in waters off Canada and Alaska, which caused friction between Canada and the U.S. until the matter was arbitrated during the administration of Cleveland; and a dispute that arose when, according to the point of view of the U.S., Great Britain was attempting, despite the Monroe Doctrine, to add Venezuelan territory to British Guiana (now Guyana). The Venezuelan boundary question (see **VENEZUELA: History**) was so sharply disputed by the diplomats of Great Britain and the U.S. that a war fever was engendered in both countries; the matter was finally settled in 1897 by arbitration, largely in favor of Great Britain. The last third of the century was also marked by the acquisition by the U.S. of harbor privileges in the Samoan Islands, and in 1899 by the acquisition of the island of Tutuila; see **SAMOA**. In 1893 a revolution in the Hawaiian Islands led by American sugar planters, who had acquired large interests there since earlier in the century, resulted in the overthrow of the Hawaiian monarchy and in the subsequent annexation of the island group by the U.S. in 1898. In the last twenty years of the century the U.S. also ac-

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quired a number of additional islands in the Pacific, including Wake and Midway.

The outstanding conflict with a foreign government in the second half of the 19th century was that with Spain over the island of Cuba. During the Ten Years' War (q.v.), which took place between 1868 and 1878 between Spain and its Cuban subjects, a Spanish warship captured the steamer *Virginius*, which was bringing supplies to the Cuban insurgents, and executed a number of the crew, including eight Americans; the so-called *Virginius* Affair aroused considerable ill-feeling in the U.S. against Spain. Matters came to a climax when the U.S. battleship *Maine*, lying in the harbor of Havana to give protection to U.S. citizens in Cuba, was blown up on Feb. 15, 1898, with the loss of two officers and 266 men. Although it was never determined whether the *Maine* was blown up by the Spanish, by Cuban action, or by internal combustion, general opinion in the U.S. placed the onus on Spain. On April 19, 1898, Congress

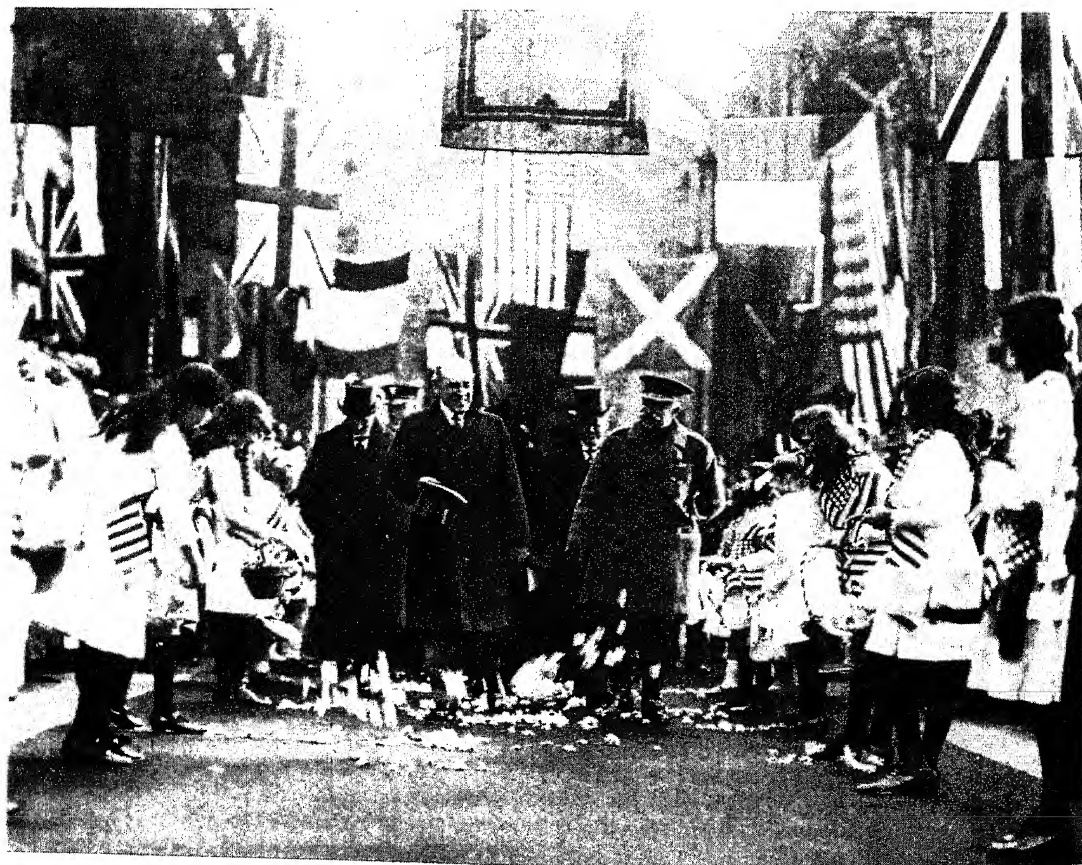
adopted a resolution that recognized the independence of Cuba, demanded that Spain withdraw from Cuba, and authorized the President of the United States to employ force to carry out the resolution; this was practically a declaration of war against Spain.

In the brief war that ensued (see SPANISH-AMERICAN WAR) the U.S. won a decisive victory. The Treaty of Paris, which concluded the conflict on Dec. 10, 1898, provided for the independence of Cuba; the cession by Spain to the U.S. of Puerto Rico, Guam, and the Philippine Islands; and the payment to Spain of \$20,000,000 by the U.S. for the Philippines. The acquisition by the U.S. of distant territories was denounced by many Americans as imperialism, and considerable opposition to the treaty was expressed in the Senate before that body finally ratified it. That the American people on the whole were in accord with the policy of territorial expansion of the McKinley administration was made clear by McKinley's victory over Bryan in the Presidential election of 1900, in which this policy was the principal issue (see above).

AFTER THE SPANISH-AMERICAN WAR. The conclusion

World War I erupted in 1914. The U.S. at first stayed neutral, and President Woodrow Wilson (left, hatless) tried to reconcile the belligerents.

National Archives



of the Spanish-American War saw the U.S. confronted with the problem of organizing and administering Puerto Rico, the Philippines, and Cuba, now independent of Spain and under American occupation. The U.S. held a protectorate over Cuba until 1902; in that year, after the Cubans had incorporated into their constitution a number of provisions insisted upon by the U.S. for its own military and commercial advantage (see PLATT AMENDMENT), and had held elections, the U.S. occupation forces turned Cuba over to its first president, Tomás Estrada Palma. For details of the relationship between the U.S. and Cuba after 1902, see *CUBA: History*. In regard to Puerto Rico, by terms of the Foraker Act, Congress in 1900 set up a civil government in that American possession; and in 1917 the Jones Act granted American citizenship to Puerto Ricans. The policy of the U.S., as stated in the first decade of the 20th century, was to give the people of the Philippines their independence as soon as they were fit for it; it was not until July 4, 1946, however, that the Philippines at last became a sovereign state; see *PHILIPPINES, REPUBLIC OF THE: History*.

During the administration of President Theodore Roosevelt the foreign policy of the U.S. was an aggressive one; in the Caribbean area, in the Far East, and elsewhere American policies were vigorously stated and when necessary enforced by diplomatic or military action. The Spanish-American War, during which American naval units in the Pacific were forced, when needed in the Caribbean Sea, to steam down the coast of South America, around Cape Horn, and then northward, proved the necessity for an ocean-to-ocean canal either in Nicaragua or the Isthmus of Panama, which for reasons of national defense would be under exclusive American control. On the initiative of President Roosevelt, the U.S. in 1903 concluded the Hay-Herrán Treaty with Colombia, of which Panama was then a province, granting the U.S. a long-term lease over a 10-mi.-wide zone in Panama. The Colombian senate rejected the treaty, whereupon a rebellion, actively supported by the U.S. (see *COLOMBIA: History*), broke out in Panama, which became an independent republic. By the Hay-Bunau-Varilla Treaty of 1903 with the Republic of Panama, the U.S. obtained in perpetuity, for an initial payment of \$10,000,000 and an annual payment of \$250,000, the 10-mi. zone it required for a canal. Construction of the canal was begun at once and completed in 1914.

In the Far East, at the outbreak of the Russo-Japanese War (q.v.), Roosevelt secured the recognition by the belligerents of the neutrality of

all of China with the exception of Manchuria; kept France and Germany from helping Russia; and in 1905, by his mediation, brought about the Treaty of Portsmouth, which ended the war.

The foreign policy of the U.S. during the administration of Woodrow Wilson was concerned with four principal problems: that of Japanese protest against the California Land-holding Act or Webb Act of 1913; British objection to American policy regarding tolls for the Panama Canal; the Mexican situation; and World War I.

By the Webb Act, California denied to Japanese the right to acquire land or long leaseholds. Japan protested that this Act violated rights given it by treaty with the national government; but the Federal government disclaimed the power to interfere with State laws such as the Act in question. By the Tolls Act of 1912, the U.S. levied tolls on all vessels using the Panama Canal excepting those of U.S. registry employed in coastwise trade. Great Britain protested that the Act violated treaty rights that had guaranteed equality of treatment in the Panama Canal for the ships of all nations. At the urging of President Wilson, who desired to avoid friction with Great Britain while engaged in controversy with Japan, and was eager to obtain British support for American policy in Mexico (see below), and for other reasons, Congress repealed the Act in 1914.

The situation in Mexico had, since 1910, caused the American government great concern. In 1911 the government of the dictator, Porfirio Díaz, had been overthrown by a revolution led by the reformer Francisco Madero. Madero, whose efforts to bring about reforms in Mexico were looked upon sympathetically by the U.S., was murdered in 1913, and General Victoriano Huerta seized the government and ruled as a dictator. Although twenty-two of the twenty-seven Mexican states supported Huerta, and twenty-six foreign nations recognized him as president of Mexico, Wilson refused to recognize him on the grounds that the new regime had brought about the murder of Madero and was in addition too weak to keep order in Mexico. In 1914 the U.S. aided General Venustiano Carranza, the leader of a revolution against Huerta, by making it possible for Carranza to obtain arms in the U.S. Huerta retaliated by acts of reprisal upon U.S. nationals, and the U.S. countered by forcibly occupying Veracruz; the landing operations there cost seventeen American lives. Mediation by Argentina, Brazil, and Chile (the so-called ABC powers) in order to prevent war between Mexico and the U.S. re-

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sulted in the resignation of Huerta and the assumption of power by Carranza, whose government the U.S. recognized in 1915. A number of rebellions had been in progress against Carranza; all the leaders of these but one, Francisco ("Pancho") Villa, now laid down their arms. Villa still refused to obey Carranza's authority, also attacked foreigners, and in 1916 led a raid into Columbus, N.Mex., partly destroying the town by fire and killing sixteen persons. With the permission of Carranza, the U.S. sent into Mexico a military force under General John J. Pershing to find and punish Villa. He eluded pursuit; Carranza, fearing that the U.S. force might be used against his government, demanded its withdrawal, and the expedition was recalled without having accomplished its purpose. For relations between Mexico and the U.S. after 1916, see *MEXICO: History*.

WORLD WAR I. The most difficult and far-reaching problems of foreign policy that arose in Wilson's administration were caused by World War I. At the outbreak of the war in Europe in 1914 between the Central Powers and the Triple En-

tente (qq.v.), President Wilson formally proclaimed the neutrality of the U.S. His proclamation was not sufficient, however, to prevent strong partisan feeling from arising in the U.S., nor could it prevent American difficulties with both warring groups in respect to American neutral rights. The U.S. charged that Great Britain, in the course of maintaining a blockade against the Central Powers, was interfering with U.S. shipments to other neutral nations, and was in other ways violating U.S. neutral rights at sea. The British replies to these protests, although not entirely satisfactory, were sufficiently reasonable and conciliatory to mollify U.S. public opinion. The dispute between the U.S. and Germany was far more serious. In order to prevent food, munitions, and other supplies from reaching Great Britain, Germany in 1915 declared the waters surrounding Great Britain and Ireland a war zone in which German submarines would sink all enemy vessels without the visit or search stipulated by international law; to avoid the possibility that neutral vessels might be sunk by mistake, or that neutrals might be killed, Germany warned neutral ships not to enter the zone, and advised citizens of neutral nations not to travel on ships of the Allied nations. To U.S. protests against this declaration Germany

In 1917 Congress declared war on Germany and U.S. troops were sent into the conflict. The picture shows an American gun crew advancing through Belleau Wood in June 1918.

Granger Collection



Although Wilson's foreign policy of neutrality and world peace inevitably deteriorated into intervention and war, the domestic accomplishments during his administration included some of the most extensive reforms ever achieved in government. A constitutional amendment, ratified in 1920, extended voting rights to American women.

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made an intransigent reply; and in May, 1915, a German submarine torpedoed the British passenger liner *Lusitania* off the Irish coast with a loss of more than 1100 persons, of whom 100 were U.S. citizens. Even though Germany asserted that the *Lusitania* had been carrying munitions to England, public opinion in the U.S. was outraged by the sinking; and strong protests by the U.S. State Department obtained from Germany a promise thereafter not to sink passenger liners without taking precautions to protect the lives of noncombatants.

In March, 1916, however, a German submarine sank an unarmed French Channel steamer, the *Sussex*, with the loss of two Americans; whereupon President Wilson threatened to sever diplomatic relations with the German government unless it abandoned "its present methods of submarine warfare against passenger and freight-carrying vessels". In May the German government pledged itself not to sink merchant vessels without warning and without saving the lives of those aboard; and for nine months the pledge was kept generally to the satisfaction of the U.S. Wilson's vigorous diplomacy seemed to have averted war with Germany, and as the Democratic candidate in the Presidential election of 1916, Wilson was elected over the Republican nominee, Charles E. Hughes, largely because "he kept us out of war". The war, however, was inevitable, and was not long in coming. At the end of January, 1917, Germany broke the so-called *Sussex* Pledge by declaring unrestricted submarine warfare in a zone even larger than the one it had proclaimed in 1915. In reply,

on Feb. 3, Wilson broke off diplomatic relations with Germany, and later in the month, at his request, Congress passed a bill permitting U.S. merchant vessels to arm. New depredations by German submarines against neutral shipping, and the discovery of a plan made by the German Foreign Office to unite Germany, Mexico, and Japan against the U.S. in case the U.S. entered the war, led Wilson on April 2, 1917, to request Congress to declare war. On April 6, Congress passed a resolution declaring a state of war with Germany. See WORLD WAR I.

President Wilson played an important part in the peace conference in 1919 at Paris that followed the defeat of Germany; but his intention of bringing about a peace based on his program, known as the fourteen points (q.v.), was frustrated by the adroit diplomacy of the other Allies, who were intent on inflicting penalties upon Germany. The Treaty of Versailles (see VERSAILLES, TREATY OF), which declared Germany guilty of all the economic losses sustained by the peoples of the Allied nations and established a reparations (q.v.) commission that subsequently imposed upon Germany reparations amounting to \$56,000,000,000, was signed by Germany only after protest. The only important part of Wilson's peace program that was written into the treaty was the covenant of the League of Nations. Although Wilson toured the U.S. to arouse sentiment in favor of the treaty and the League, the U.S. Senate in March, 1920, refused to ratify it. Subsequently, treaties between the U.S. and Germany, Austria, and Hungary were separately negotiated and ratified by the Senate.

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Between the Two World Wars. This period of approximately two decades was marked principally by a series of social and economic reforms that brought about some of the most drastic changes in the life of the nation since its inception; and by the gradual shaping of American foreign policy to one of active opposition to the rise of totalitarianism (q.v.) in Europe. President Franklin Delano Roosevelt was primarily responsible for the social and economic reforms, known collectively as the New Deal. Under President Roosevelt, also, the U.S. gave steadily increasing aid to the nations fighting the totalitarian Axis powers (q.v.) in World War II, which broke out in Europe in 1939; and in 1941 itself entered the war.

PROSPERITY, PANIC, AND DEPRESSION (1920–32). The American people elected as President, in 1920, Warren Gamaliel Harding, the Republican candidate. The Harding administration was for American industry a time of unusual prosperity, which, in spite of the fraud and corruption discovered among high government officials appointed by Harding, was responsible for a Republican victory in the Presidential campaign of 1924, when Calvin Coolidge defeated the Democratic nominee, John W. Davis, and also Robert M. La Follette, candidate of the League for Progressive Political Action. In the campaign of 1928, in which the Republican, Herbert Clark Hoover, ran against the Democrat, Alfred E. Smith, continued prosperity and the fact that Smith was a Roman Catholic and advocated the repeal of the Eighteenth Amendment, which had established prohibition in the U.S. (see below), led to another Republican victory. During this period (1920–32) of Republican domination of the national government, a number of important economic and social problems confronted the nation, including questions involving the tariff, the farmers, the railroads, public utilities, immigration, labor, prohibition, and the results of the panic of 1929.

This period of Republican domination was one of high tariffs. The Fordney-McCumber Tariff of 1922 was a protective tariff that restored customs duties to about the level of the protective Payne-Aldrich Tariff of 1909, and the Hawley-Smoot Act of 1930 raised the rates in many schedules even higher than those in the Fordney-McCumber Tariff; see **TARIFFS, UNITED STATES**. The Hawley-Smoot Tariff was criticized by many economists and statesmen as an unfortunate example of economic nationalism at a time when a great need for international cooperation existed in the world; moreover, as reprisal against the high rates of the tariff, in the

two years following its enactment, more than twenty nations raised the levels of their tariff duties against goods from the U.S.

For the American farmer, the period following that of World War I, which had been prosperous because of the worldwide demand for American farm products and the increased use of machinery in American agriculture, was characterized by low prices and economic distress caused chiefly by a surplus of farm products. A so-called farm bloc was formed in Congress to secure legislation that might relieve the economic plight of the farmer. The principal bill sponsored by the farm bloc, the McNary-Haugen Bill, designed to curb the production of surpluses of farm staples, was vetoed by Presidents Coolidge and Hoover; and the Agricultural Marketing Act of 1929, supported by Hoover and designed to promote the marketing of farm products and to provide for government purchases of certain crops in order to support their prices, failed to stem the trend to lower farm prices.

In Harding's administration the railroads, which had been in economic distress for some time because of growing competition from other means of transportation, such as improved waterways, oil pipelines, and motor-transport companies, also turned to the government for aid. The Railroad Transportation Act, passed in 1920, in some measure relieved the situation by providing for the unification of independent lines into large systems; see **RAILROADS: United States Railroads**. In respect to public utilities, this period saw the beginning of attempts by the Federal government to regulate the rate for electric power charged by private companies operating across State lines. In 1920 Congress created the Federal Water-Power Commission to license hydroelectric plants on navigable rivers, public lands, and Indian reservations; see **WATER POWER**. The problem of regulating public-utility companies that operated only within a State was met during the second and third decades of the 20th century in nearly every State by the appointment of a public-service commission; see **PUBLIC UTILITIES, REGULATION OF**. Twice during the period 1920–32 Congress passed bills that would have enabled the Federal government itself to enter the business of generating and selling electric power; however, President Coolidge vetoed the bill sponsored by Senator George William Norris of Nebraska in 1928, which provided for establishing a government-owned corporation to operate electric-power facilities at Muscle Shoals on the Tennessee R., and in 1930 President Hoover vetoed a similar

bill. In 1933, in the administration of Hoover's successor, Franklin D. Roosevelt, the Tennessee Valley Development Act was passed by Congress and signed by the President; see TENNESSEE VALLEY AUTHORITY.

The question of regulating immigration into the U.S. also became important after the close of World War I. In the 1920's Congress reversed the traditional U.S. policy of unrestricted immigration by passing two acts, one in 1921 and one in 1924, that considerably reduced European immigration; see IMMIGRATION: *Legislation Regulating Immigration into the United States*. In labor circles the period 1920-32 was marked by the decline of trade unionism (the American Federation of Labor had about 4,000,000 members in 1920, about 3,000,000 in 1930, and about 2,500,000 in 1932), and the growth of industrial unionism, the latter tendency culminating in 1935 in the formation of the Committee for Industrial Organization, in 1938 constituted as the Congress of Industrial Organizations, popularly known as the C.I.O.; see TRADE UNIONS IN THE UNITED STATES.

The most violently controversial issue of the period 1920-32 was that of prohibition (q.v.). The movement to prohibit the manufacture and sale of intoxicating beverages in the U.S. originated in the early part of the 19th century and reached its culmination with the passage, in December, 1917, of the Eighteenth Amendment to the Constitution. In 1929 a commission appointed by President Hoover and headed by a former United States attorney general, George Woodward Wickersham, reported that Federal enforcement of the liquor laws was a failure. Public sentiment, meanwhile, had steadily been growing for repeal of the Eighteenth Amendment, and in February, 1933, Congress passed and submitted to the States the Twenty-first Amendment to the Constitution, which gave the control of the liquor traffic back to the individual States; by December, 1933, thirty-six States had ratified the Twenty-first Amendment and it was declared part of the Constitution. See also ANTI-SALOON LEAGUE OF AMERICA; CONSTITUTION OF THE UNITED STATES: *Amendments to the Constitution*; PROHIBITION PARTY; TEMPERANCE.

Absorbing as was the controversy over prohibition, public interest in the first year of the Hoover administration became diverted to an event that shook the very economic foundations of the nation, namely, the stock-market panic of 1929; see STOCK MARKET. During the period of prosperity, marked by high wages and increased production and consumption of goods, which the country had enjoyed since

World War I, the general public had developed a tendency to invest savings and earnings in speculative ventures, particularly the buying of stocks on margin. The ever-increasing demand for stocks and the prosperous state of the nation as a whole led to a general rise in the prices of securities, and this in turn led to increased investments in them. The rise in stock prices reached its height in the so-called Hoover bull market of the first six months of the Hoover administration. During this period individuals from every stratum of society invested a total of billions of dollars in the stock market, obtaining the money for such investments by borrowing from banks, mortgaging homes, and selling sound government securities, such as Liberty Bonds. In August, 1929, stockbrokers were carrying on margin for their clients approximately 300,000,000 shares of stock. By October, 1929, the feverish wave of buying had exhausted itself and gave way to an equally feverish wave of selling. Prices dropped precipitately, and thousands of investors lost all they had invested, which in many cases meant complete financial ruin. On Oct. 29 the New York Stock Exchange, largest in the world, collapsed. By the end of the year declines in stock values reached \$15,000,000,000.

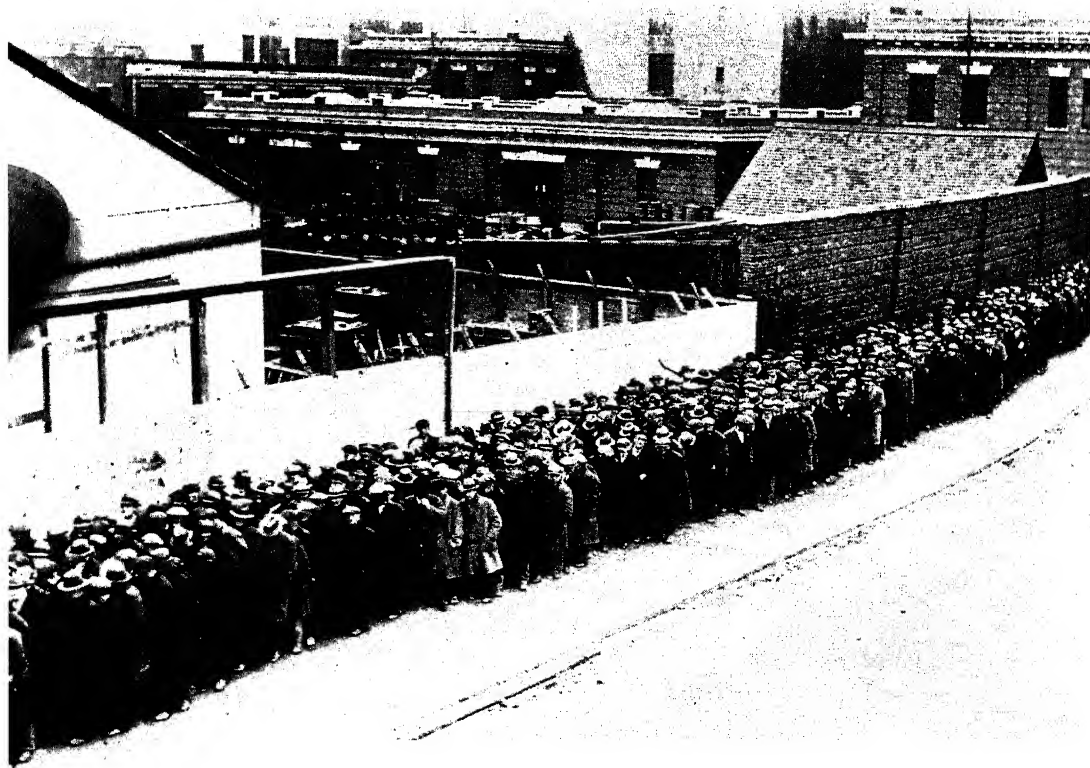
The stock-market panic was the prelude to an economic depression that not only spread over the U.S., but in the early 1930's became worldwide; see BUSINESS CYCLE. In the U.S., in spite of the optimistic statements of President Hoover and his secretary of the treasury, Andrew W. Mellon, that business was "fundamentally sound" and a new era of prosperity was just about to begin, many factories closed, unemployment (q.v.) steadily increased, banks failed in increasing numbers, and the prices of commodities steadily fell. The administration began to take steps to combat the crisis. Among the measures taken were the granting of emergency appropriations for farm relief and public works, modification of the rules of the Federal Reserve System to make it easier for businessmen and farmers to obtain credit, and the establishment of the Reconstruction Finance Corporation (q.v.), with assets of \$2,000,000,000, to make emergency loans to industries, railroads, insurance companies, and banks. Nevertheless, the economic depression steadily became worse during the remainder of the Hoover administration. By 1932 hundreds of banks had failed, hundreds of mills and factories had closed, mortgages on farms and houses were being foreclosed in large numbers, and more than 10,000,000 workers were unemployed. The Presi-



dential campaign of 1932, in which the Republican candidate was Hoover and the Democratic candidate was Franklin D. Roosevelt, was waged on the issues of prohibition and the economic crisis. The Democratic platform declared for outright repeal of the Eighteenth Amendment and promised a "new deal" in economic and social matters to bring about recovery from the depression. The Republicans did not call for outright repeal; and in regard to the depression, they warned against the danger to business and the national finances if the social and economic philosophies of the Democrats were substituted for the sound and conservative ideas of the Hoover administration. The Democrats won an overwhelming success in the election, carrying all but six States.

Postwar prosperity was abruptly choked off by the financial panic of 1929 and eclipsed by the serious economic depression that followed. In 1932 more than 10,000,000 Americans were unemployed. Common urban sights were men selling apples (left) to earn some living and the jobless waiting on breadlines (below) for free food.

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FOREIGN AFFAIRS (1920–32). In foreign relations the administrations of Harding, Coolidge, and Hoover were concerned principally with the problems of war debts due the U.S., and the related reparations due from Germany to the Allied nations, and with attempts of the U.S. to obtain from other nations cooperation in measures that would bring about permanent world peace.

During World War I and shortly afterward the U.S. government had lent a total of about \$10,000,000,000 to the countries allied in the war against Germany; and by 1922 the Allies owed the U.S. this sum plus accumulated interest of \$1,500,000,000. Because the debtor nations claimed they were unable to pay the full amount they owed, in 1922 Congress created the World War Foreign Debt Commission, which during the next four years negotiated agreements with the debtor nations that materially reduced their debts and provided for annual payments on them to be distributed over a period of sixty-two years. Most of the debtor nations made their annual payments contingent on the reparations payments made to them by Germany. When Germany in 1923 began to default on its reparations payments, the U.S. was instrumental in formulating plans, in 1924 and 1930, to help Germany pay by reducing the German obligations and extending credits to German industry. For details of these plans see REPARATIONS.

During the period 1920–32 the U.S. attempted to bring about permanent world peace in three ways: by promoting a policy of international limitation of armaments; by cooperating with France in the framing of a pact to renounce war as an instrument of national policy; and by cooperating with the League of Nations. During this period the U.S. participated in four international conferences for the purpose of bringing about a limitation of armaments: the Washington Conference (q.v.) of 1921–22, at which a five-power treaty was signed providing chiefly for a ten-year cessation of naval construction; the Geneva Conference held in 1927, at which the U.S., Great Britain, and Japan tried unsuccessfully to come to agreement for further disarmament; the London Naval Conference of 1930; and a General Disarmament Conference at Geneva in 1932, which ended in failure in 1934. A most earnest attempt to bring about world peace was the Kellogg-Briand Pact (q.v.) of 1928, initiated by Aristide Briand, then French foreign minister, and sponsored also by Frank Billings Kellogg, then the American secretary of state. Fifteen nations signed this agreement to re-

nounce aggressive warfare and to settle disputes by peaceful means. The U.S. Senate ratified the pact in 1929. In regard to the League of Nations, although the U.S. refused to enter this organization in 1920, during the following twelve years it cooperated with the nonpolitical agencies of the League and with efforts made by the League to bring about general disarmament and permanent world peace. See also DISARMAMENT.

THE ROOSEVELT ADMINISTRATION: THE NEW DEAL (1932–40). The broad economic and social policies of the Roosevelt administration and the enactments of Congress, usually initiated or sponsored by Roosevelt, which implemented these policies, are collectively known as the New Deal (q.v.). The New Deal had as its purpose both the bringing about of recovery from the economic depression that had followed the financial crisis of 1929, and also the taking of measures designed to stabilize the national economy so as to prevent severe economic crisis in the future.

The administration at once set up a number of agencies for the purpose of bringing immediate relief to the unemployed and needy. Relief funds for the unemployed were distributed through State and local agencies and through several Federal agencies that created temporary jobs. Farmers, industry, and labor were aided. During this period both agriculture and labor were basically changed through such legislation as the Agricultural Adjustment Act, passed in 1938, and the National Labor Relations Act, passed in 1935. Through the Rural Electrification Administration, established in 1936, the rural areas of the country began a long-term modernization of rural living conditions that eventually brought modern appliances and equipment to farms and small communities. Housing legislation included the institution of the Home Owners' Loan Corporation (H.O.L.C.), the Federal Housing Administration (q.v.), and the United States Housing Authority; see also HOUSING AND HOME FINANCE AGENCY. By the Social Security Act, passed in 1935 and amended in 1939, the U.S. took one of the greatest steps in its history toward providing economic security for the masses of its population; this act provides old-age benefits, unemployment compensation, and welfare services for mothers, children, the aged, and the blind; see FEDERAL SECURITY AGENCY; SOCIAL INSURANCE; SOCIAL SECURITY; SOCIAL SECURITY ADMINISTRATION.

The earliest sufferers from the financial panic of 1929 were investors in securities and depositors in banks; the interests of these groups were also considered by the New Deal. The Federal Securities Act (1933), through Federal supervi-

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sion of new issues of securities and other means, gave protection to investors against fraudulent practices; and this protection was broadened by an act (1934) that provided for a Securities and Exchange Commission (q.v.) to regulate stock exchanges. To protect bank depositors Congress passed the Emergency Banking Law (1933), which gave the President the power to reorganize insolvent banks; and the Banking Act of 1933, the principal feature of which was a provision for the insuring of bank deposits by the Federal Deposit Insurance Corporation (q.v.). The Roosevelt administration also established a monetary policy designed to bring about a general rise in the price level of commodities in order to counteract the steady fall in such prices that had begun with the panic of 1929. The chief feature of the President's mildly inflationary monetary policy was the devaluation, by executive order in 1934, of the dollar down to 59.06 of its former value in terms of gold; at the same time he established a stabilization fund of \$2,000,000,000 to keep the dollar at this value in international exchange.

The New Deal also gave aid to large-scale business. Making extensive use of the Reconstruction Finance Corporation (R.F.C.), which had been set up in the Hoover administration, the Roosevelt administration made large loans to railroads, building-loan companies, banks, agricultural-credit corporations, and insurance companies; between 1932 and 1937 the government lent more than \$6,500,000,000 through the R.F.C. To raise the money necessary to finance the New Deal program, the government increased taxes on incomes, gifts, estates, corporate earnings, and excess profits through the Revenue Act of 1935, and also borrowed money. In 1933 the gross public debt of the U.S. was \$22,500,000,000; in 1939 it was \$40,439,000,000.

The program of the New Deal, with its unprecedented broadening of both the legislative and executive powers and its enlargement of the part the national government played in the economic and social life of the nation, brought unlimited praise from some. They believed that the New Deal by its modification of the American free-enterprise economic system had saved the country from adopting, possibly by revolutionary means, either a socialist or fascist system. The New Deal was severely condemned by others, who saw in Roosevelt's policies only a dangerous curtailment of the rights assured by the free-enterprise system. In the 1936 election, in which Roosevelt ran against Alfred M(ossman) Landon (q.v.), the Republican nominee, Roosevelt won one of the greatest political vic-

tories in U.S. history; he carried every State except Maine and Vermont.

The second term of President Roosevelt, in which he continued the policies of the New Deal, was marked particularly by a controversy concerning the Supreme Court. The Court had held unconstitutional a number of administration measures, including the National Industrial Recovery Act of 1933, the Farm Mortgage Act of 1934, and the Agricultural Adjustment Act of 1933. Roosevelt proposed a bill to enlarge the Court from nine to fifteen members in the hope of lessening Court opposition to New Deal legislation, but the Senate would not pass it. Between 1937 and 1941, however, eight justices resigned or died, and the President appointed others more favorable to the New Deal.

Further information on this period may be found in *AGRICULTURE: Agriculture in the United States*; *HOUSING: Early Federal Aid to Housing*; and in separate articles on many of the agencies mentioned.

THE ROOSEVELT ADMINISTRATION: FOREIGN POLICY (1932-41). The foreign policy of the U.S. during the Roosevelt administration was concerned at first with efforts to extend American foreign trade, especially in the countries of Latin America; then with the problems created by the war between Japan and China, which broke out in 1937, and the outbreak of World War II in 1939; and finally with the military and diplomatic efforts necessitated by the entrance in 1941 of the U.S. into World War II (see below, *World War II and Postwar Problems*).

Extension of American foreign trade was stimulated by the organization in 1934 of the export-import banks (see *EXPORT-IMPORT BANK OF THE UNITED STATES*), through which the government was to make loans to firms intending to increase their sales in foreign countries; and by reciprocal trade agreements made between the U.S. and foreign countries for mutual lowering of tariff duties (see *RECIPROCITY*). Between 1934, when Congress authorized the making of such agreements by the executive without Congressional approval, and 1939, Secretary of State Cordell Hull concluded twenty-one such reciprocal trade agreements. A policy, popularly known as the "good neighbor policy", of amicable relations with the countries of Latin America resulted in considerable extension of American trade there. Among the measures taken were the abrogation in 1934 of the Platt Amendment, by which the U.S. since 1902 had exercised a measure of control in the internal affairs of Cuba, and the ending of U.S. control over the customs system of the Dominican Republic.



In 1932 Franklin D. Roosevelt (left) pledged economic recovery and governmental reform. UPI

When Mexico in 1938 expropriated U.S. properties, Secretary of State Hull merely asked that adequate compensation be paid.

Meanwhile the U.S. had adopted measures designed to keep it out of the war that had been threatening to break out in Europe since the coming to power in Germany of the National Socialist Party (see NATIONAL SOCIALISM) in 1933. To prevent Americans from becoming financially interested in European conflicts, the Johnson Act of 1934 prohibited the U.S. sale of the securities of any nation in default on its obligations to the U.S. In addition, three neutrality acts (1935-37) prohibited to American citizens actions that might aid a foreign belligerent; in particular, an embargo was placed on the export of "arms, munitions, and implements of war".

Despite the policy of neutrality, the moral feeling as well as the material interests of the U.S. forced it to take a definite stand against the aggressive acts of Japan in Asia and of Germany and Italy in Europe. In 1937 President Roosevelt proposed that aggressive nations be "quarantined" by means of an economic boycott; he later declared that his policy of opposition to totalitarian dictatorship should be implemented by all means "short of war".

With the outbreak of World War II in Europe in September, 1939, American aid to the nations resisting fascist aggression became definite and vigorous. Late in 1939 Congress repealed the arms embargo laid down in the neutrality acts; France and Great Britain could henceforth purchase war supplies in the U.S. In September, 1940, the American government transferred to the British fifty over-age destroyers, receiving in return long leases on sites for American naval and air bases on British possessions in the Western Hemisphere. The German successes in the spring of 1940 led to immediate measures to strengthen U.S. defenses.

In 1940 Congress authorized loans to Latin-American countries for defense purposes. The U.S. and Canada set up the Permanent Joint Board to provide for North American defense. Domestic defense was in the meantime accelerated by a Congressional appropriation of \$18,000,000,000 to construct an American navy large and strong enough to be successful against any possible combination of foreign navies, and to raise an army of 1,200,000; by the passage in September, 1940, of the first U.S. peacetime

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scription act; and by measures to mobilize the industrial resources of the country for possible war.

In 1940 the Democratic Party nominated Roosevelt for a third term, breaking the precedent of only two terms for a President, on the ground that it would be inadvisable to change administrations in so critical a period. He decisively defeated the nominee of the Republican Party, Wendell L. Willkie.

After the reelection of Roosevelt, Congress in March, 1941, passed the Lend-Lease (q.v.) Act, by the terms of which the President was empowered to transfer, sell, lend, or lease war supplies to any nation whose defense was vital to American security.

An alliance between Great Britain and the U.S. was foreshadowed by the announcement in August, 1941, of the Atlantic Charter (q.v.), a statement of the eight bases for peace that the two countries desired to see established; the charter was drawn up by President Roosevelt and the British prime minister, Winston Churchill. The year 1941 was marked also by a heated nationwide debate between the "isolationists", who opposed both U.S. participation in World War II and the giving of aid to Great Britain; and the "interventionists", who felt that victory over the Axis powers was essential for U.S. security and were prepared for U.S. entry into the war at an appropriate time.

Toward the end of July the U.S. State Department forbade the export to Japan of war materials, and it later rejected an agreement of friendship proposed by Japan on condition that the U.S. acknowledge the Japanese conquest of China.

On Dec. 7, 1941, while a special Japanese envoy was in Washington ostensibly on a mission to negotiate an understanding over affairs in the Pacific, the Japanese government launched a surprise bombing attack by air on the American naval base at Pearl Harbor (q.v.) in the Hawaiian Islands. On the following day, at the request of the President, Congress declared a state of war between the U.S. and Japan. On Dec. 11 Germany and Italy declared war upon the U.S.

World War II and Postwar Problems. The military participation of the United States in World War II is fully discussed in the separate article WORLD WAR II. For some of the recurring problems and issues of the period, see CIVIL DISOBEDIENCE; CIVIL RIGHTS AND CIVIL LIBERTIES; NEGROES IN THE UNITED STATES for domestic events and BERLIN; KOREAN WAR for foreign affairs.

THE HOME FRONT. The mobilization of the U.S. for

war was carried out through a number of agencies covering virtually every area of the U.S. economy. The National Defense Research Committee directed scientific and technical research for military purposes. Conversion of industry from consumer to wartime production was overseen by the War Production Board. The Office of Price Administration (q.v.) attempted to control prices, administer rationing, and check profiteering. After 1943 these agencies were organized under the Office of War Mobilization, which assumed complete control over prices and the issuance of priorities. Wages, rents, and food prices were strictly regulated, and scarce items such as meat, sugar, and gasoline were rationed. The newly created defense plants provided new employment for women and especially for Negroes, who, despite continuing segregation in the armed forces and elsewhere, made significant economic advances during this period; see WOMEN, EMPLOYMENT OF: *American Working Women*. To overcome problems of labor shortage in the rapidly expanding economy, the War Labor Board limited wage increases and obtained no-strike pledges from the unions. The war economy was financed through increased taxation and through a rise in the national debt from \$49,000,000,000 in 1941 to \$280,000,000,000 in 1945. Generally, despite increasing government authority, disregard for civil liberties never reached the intensity of the World War I period, except in the internment of 112,000 Americans of Japanese ancestry, allegedly to prevent sabotage and subversion. Financial assistance was provided for war veterans through the so-called G.I. Bill of Rights; see VETERANS ADMINISTRATION.

President Roosevelt, in addition to supervising the entire war effort of the U.S., made extraordinary efforts to cooperate in the conduct of the war with the other powers fighting against the Axis, and at the same time to lay the foundations for peace. His diplomatic efforts took the form principally of a series of conferences, chiefly with Prime Minister Churchill of Great Britain and Premier Joseph Stalin of the U.S.S.R. The conferences included meetings with Churchill from 1941 to 1943 at Washington, Québec, and Casablanca (q.v.), where Roosevelt discussed the military conduct of the war and proposed the principle of unconditional surrender by the Axis. At a conference in 1943 at Cairo, Egypt (see CAIRO CONFERENCE), he planned the prosecution of the war against Japan with Churchill and Generalissimo Chiang Kai-shek of China. At Tehran (see TEHRAN CONFERENCE) in 1943, with Churchill and Stalin, he formulated

plans for a concerted attack on Germany; at Yalta, U.S.S.R. (see *YALTA CONFERENCE*), in 1945 with the same principals, decisions were made to divide Germany into zones of occupation, to establish the United Nations (q.v.), and to bring the Soviet Union into the war against Japan. Several other conferences laid the foundation for the organization in 1945 of the U.N., and other forms of worldwide cooperation after the war; notable among them were the meetings in Moscow in 1943; at Bretton Woods, N.H. (see *BRETTON WOODS CONFERENCE*; *INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT*); and at Dumbarton Oaks (q.v.), in Washington, D.C., at which basic plans were adopted for organizing the U.N.

In the Presidential campaign of 1944, Roosevelt ran for a fourth term, defeating the Republican candidate, Governor Thomas Edmund Dewey of New York. On April 12, 1945, Roosevelt suffered a cerebral hemorrhage and died. His long administration was notable for its economic reforms, its successful conduct of the war, and its establishment of a basis for world peace. These policies formed the foundation of the new administration when Roosevelt was succeeded by Vice-President Harry S. Truman. *THE TRUMAN ADMINISTRATION*. The new President was essentially a political moderate, who had distinguished himself in the Senate investigations of wartime waste and inefficiency in military spending. His first problems as President were the conclusion of the war and the establishment of world peace. German resistance was virtually at an end, and on May 7, 1945, Germany surrendered to the Allies. Meanwhile, in the Pacific theater, U.S. forces were fighting difficult but successful campaigns in the advance toward the Japanese home islands. In the atmosphere of impending victory, a conference of the U.N. met in San Francisco to draft a charter for a permanent world organization to ensure lasting peace.

The increasing difficulties in Soviet-American relations, however, became evident at the Potsdam Conference (q.v.) in Germany in July, where agreements relating to the final division of Germany were reached. Some Americans, led by President Truman, had become convinced that Stalin was not living up to his agreements at Yalta to hold free elections in Rumania and Bulgaria, and Truman therefore demanded that the Russians honor their pledges. The spirit of wartime cooperation increasingly gave way to mutual suspicion, misunderstanding, and recrimination, leading to the era of conflict known as the "cold war". A momentous event developing

concurrently with the Potsdam Conference was Truman's authorization of the use of the atomic bomb on the Japanese cities of Hiroshima and Nagasaki (qq.v.). Truman made this controversial decision in order to induce a Japanese surrender and to prevent heavy American casualties in an invasion of Japan. The Japanese surrendered on Aug. 14. See also *NUCLEAR WEAPONS*.

With the conclusion of hostilities, reconversion of the U.S. economy to peacetime conditions and demobilization of the troops became the paramount issues in American domestic politics. To facilitate the process, the Truman administration formulated a twenty-one-point program calling for full employment, labor-management cooperation, heavy Federal housing subsidies, increased unemployment compensation, extension of price controls, Federal aid to education, guarantees of civil rights, increased minimum wage, and continued foreign aid. The President also recommended unification of the armed services and universal military training. Many of these programs were vigorously opposed by the Republican-dominated Congress, and Congressional rejection of price controls led to an 18 percent increase in the cost of living in 1946. The economic situation became further complicated when almost 5,000,000 workers struck for wage increases to meet the rising costs of living. In 1947 Congress responded to this strike activity by passing, over the President's veto, the Labor Management Relations Act, known as the Taft-Hartley Act, which placed limitations on the freedom to strike; see *NATIONAL LABOR RELATIONS ACT*.

Despite these domestic problems, the U.S. continued its unprecedented participation in international affairs, through membership in the U.N. and other groups, and through Allied conduct of war-crimes trials of former enemy leaders, chiefly Germans and Japanese; see *WAR-CRIMES TRIALS*. In August, 1946, the U.S. joined the International Court of Justice (q.v.). Major diplomatic questions included the U.S. proposal for U.N. control of atomic energy and atomic weapons. This proposal, known as the Baruch Plan, after its chief proponent, the American statesman Bernard Mannes Baruch, called for the turning over of atomic bombs and secrets to the U.N., whereas Soviet spokesmen demanded the destruction of existing atomic weapons prior to or simultaneously with the creation of U.N. control. In 1946 atomic control in the U.S. was transferred from the army to the civilian Atomic Energy Commission; see *NUCLEAR ENERGY*; *United States Atomic Energy Commission*. The

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National Security Act of 1947 unified the armed services through the creation of a secretary of defense and the office of the Joint Chiefs of Staff; see DEFENSE DEPARTMENT OF. It also established the National Security Council (q.v.) to plan and coordinate defense policies and the Central Intelligence Agency (C.I.A.) to gather and report strategic information from abroad.

In 1947, in an effort to halt, or "contain", the advance of Communism in Europe, and especially in Greece and Turkey, President Truman announced the policy known as the Truman Doctrine, by which the U.S. furnished military and economic aid to countries threatened by aggression and subversion. An important adjunct of this policy was the Marshall Plan, which was proposed in June, 1947, by Secretary of State George Catlett Marshall. The plan, officially designated the European Recovery Program (q.v.), was a broad program of economic rehabilitation. The policy of containment was expanded to the Western Hemisphere when, in 1947, the U.S. joined with eighteen other American nations in signing the Rio Treaty (q.v.) promising mutual defense and assistance against aggression by an American or a non-American state on any of the signatory nations. In 1948 the U.S. agreed to the establishment of the Organization of American States (q.v.), known as the O.A.S. and created to settle disputes among the twenty-one member nations. As part of his worldwide campaign against Communism, President Truman also implemented the Point Four Program (q.v.) to aid developing nations in Asia, Africa, and Latin America.

The Soviet Union responded to the Truman Doctrine and the Marshall Plan with the formation of a new Communist international (the Cominform) and a tightening of its control of Czechoslovakia. The U.S. then resolved to strengthen West Germany against Communism. In February, 1948, a plan for the economic merger of the British and American occupation zones went into effect following its acceptance by the Germans in those zones; and a conference, attended by representatives of the U.S., Belgium, the Netherlands, Luxembourg, France, and Great Britain, was held in London to discuss the eventual political and economic merger of the French, British, and American occupation zones. In reaction to this violation of the Yalta and Potsdam agreements, the Soviet delegation withdrew from the Four-Power Allied Control Council and took steps to establish a Soviet-dominated East German state. On June 24, 1948, following an agreement by the nations that had

participated in the London Conference on the creation of a West German state, and the establishment of a West German currency by the Western occupying powers, the Soviets placed a ban on all rail traffic between Berlin and West Germany. Because water and roadway transportation into the city had been suspended by an earlier Soviet action, the British and U.S. occupation authorities organized a system of air transport, known as the "Berlin Airlift", to supply the Western-occupied sectors of the city. In April, 1949, the foreign ministers of the U.S., Great Britain, and France completed plans for combining their occupation zones of West Germany into a federal republic. Also in April the U.S. and eleven Western European nations arranged a guarantee of mutual defense and assistance in the North Atlantic Treaty, which established the North Atlantic Treaty Organization (q.v.), known as NATO.

In domestic matters, Truman proposed an extensive program the civil-rights legislation, including the elimination of segregation in all forms, the enactment of laws against lynching, and the abolition of the poll tax (qq.v.). These proposals cost him the support of many Southern Democrats. When he was nominated for President at the Democratic national convention in 1948, a number of these Southerners left the Democratic Party, forming a group known as the "States' Rights Democrats", or "Dixiecrat" party, with Governor J. Strom Thurmond (1902–) of South Carolina as their Presidential candidate. Another new faction, the Progressive Party (q.v.), which viewed Truman's containment policy as a threat to world peace and urged greater efforts toward cooperation with the Soviet Union, named former Vice-President Henry Agard Wallace as its candidate for the Presidency. The Republicans renominated Dewey, whose victory in the election was regarded as virtually certain. Truman, however, won; Dewey ran second, Thurmond was third, and Wallace was fourth. The Democrats also won a majority of the contested seats in the House and Senate. See also POLITICAL PARTIES IN THE UNITED STATES.

Truman, in beginning his first full term, sought support for a legislative program known as the "Fair Deal" and comprising government control of credit exports and rents, an increase in taxes, government support of low-rent housing, government-sponsored health insurance, universal military training, and an extension of the executive power to enter into reciprocal trade agreements with other nations. Although most of these proposals were defeated in Congress, Truman was able to gain Congressional

approval for an expanded Federal housing program, minimum wage increases, and enlarged social-security benefits. He also abolished segregation in the armed forces through an executive order.

Truman's policy of containment of Communism, although generally successful in Europe, was less effective in Asia, except in Japan, where the military occupation under General Douglas MacArthur successfully built up a stable democratic government. In 1951 a peace treaty ended American occupation, and Japan became the firmest U.S. ally in Asia. In China, however, the government of Chiang Kai-shek, which had been supported by the U.S., was unable to withstand the advance of Communist forces under Mao Tse-tung. By the end of 1949, Chiang's troops had been overwhelmingly defeated, and Mao formed the Chinese People's Republic; see CHINA, PEOPLE'S REPUBLIC OF: *History*. This development caused great turmoil in the U.S. when critics charged that the Truman administration had failed to support Chiang Kai-shek against the Communists. A further disturbance of public opinion occurred in September, 1949, when Truman announced that the Soviet Union had developed an atomic bomb. Secre-

tary of State Dean Gooderham Acheson stated, however, that the loss of the U.S. nuclear monopoly would produce no fundamental change in the foreign policy of the U.S. and that the U.S. would continue to press for adoption of its nuclear control plan.

The loss of China and the resulting criticism had made the Truman administration sensitive to further Communist expansion in Asia, and in June, 1950, when South Korea was invaded by the forces of Communist North Korea, Truman announced that the U.S. would intervene to assist the South Koreans. On Nov. 26, 1950, the Chinese Communists entered the war, and General MacArthur, in command of American forces, subsequently urged that he be allowed to bomb Chinese bases beyond the Yalu R. and deploy Chiang's troops against the Communists. Truman rejected these suggestions, however, and when MacArthur became increasingly outspoken in his criticisms, the President relieved him of his command, despite widespread popular support for the general. This quarrel repre-

Another global crisis occurred with the outbreak of war on the Korean Peninsula in 1950. President Harry S. Truman (right) sent American forces to aid South Korea. General Douglas MacArthur (left) headed the U.N. command in the Asian conflict.

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A cease-fire agreement in Korea was signed mid-1953. American war dead alone neared 34,000. U.S. Army

sented a basic disagreement over tactics in the age of containment. MacArthur and his supporters believed that war must be waged only in the name of ultimate victory. Truman felt that a larger view of world affairs was essential and that nuclear warfare was to be used only as a last resort.

The conflict in Korea produced other profound repercussions on the U.S. domestic scene, including an increase in military and related expenditures from 33 to 67 percent of the national budget by 1952 and a rise of more than 5 percent in the cost of living during the first six months of the war. Wage and price controls were established, and on Dec. 16, 1950, Truman established the Office of Defense Mobilization to supervise the war effort.

The Korean War also caused severe psychological dislocations as concern about Communism within the U.S. intensified. As early as 1947, President Truman had set up a nationwide system of loyalty boards to investigate government employees. The government also prosecuted eleven leaders of the American Communist Party under the Smith Act of 1940, which prohibited groups from conspiring to advocate

the violent overthrow of the government. In 1950, Congress passed the McCarran Internal Security Act, which established a permanent Subversive Activities Control Board to follow Communist activities in the U.S. and barred from admission into the country any person who had been a member of Communist organizations. Truman vetoed the bill on the ground that it represented "a suppression of ideas in disregard to ideals which are the fundamental basis of our free society", but his veto was overridden by Congress. Considerable controversy over the degree of Communist influence in the U.S. was aroused by the activities of Senator Joseph Raymond McCarthy of Wisconsin.

The Twenty-second Amendment to the Constitution, stating that no person may serve more than two terms as President, became law on Feb. 26, 1951. Also in that year Congressional opposition to Truman's domestic programs increased, and the severe economic inflation produced by the war resulted in serious strikes in a number of major industries. On Aug. 8 the President placed the entire steel industry under Federal control to prevent a threatened nationwide strike, but the steel companies challenged the constitutionality of this action, and the Supreme Court declared the seizure unconstitutional.

The steel mills were returned to the owners, and a 54-day strike followed. Evidence of serious corruption within the government and Truman's apparent reluctance to act against the guilty parties further undermined public confidence in the Democratic administration.

In July, 1952, the Republican Party nominated General Dwight David Eisenhower and Senator Richard Milhous Nixon of California as candidates for President and Vice-President. The Democrats named Governor Adlai Ewing Stevenson of Illinois and Senator John Sparkman (1899–) of Alabama. Eisenhower won easily, and the Republicans captured control of Congress. Eisenhower's personal prestige was a major factor in the Republican victory, as was frustration over the Korean War and fear of Communism at home.

Administrations of the 1950's and 1960's. As before, many of the issues of the two decades carry over from administration to administration. *See for example, CIVIL RIGHTS AND CIVIL LIBERTIES; KOREAN WAR; NEGROES IN THE UNITED STATES; VIETNAM, WAR IN.*

THE EISENHOWER ADMINISTRATION. In contrast to Roosevelt and Truman, Eisenhower believed that the Presidency should involve considerable delegation of authority, and he therefore granted much independence to his cabinet, which was composed largely of businessmen. Despite its conservative outlook, the administration made no effort to repeal New Deal legislation. Unlike the Democrats, however, Eisenhower endeavored to limit the role of national government, calling for greater local control of governmental affairs. In addition, he reduced taxes, pressed for drastic reductions in Federal spending in order to balance the budget, and encouraged private enterprise.

Among important actions taken by the new administration after assuming office were the removal of all wage and price controls, the creation of the Department of Health, Education, and Welfare (see *HEALTH, EDUCATION, AND WELFARE, DEPARTMENT OF*), and the expansion of social-security benefits. Domestic problems faced by the administration included rising living costs, budget deficits, and falling prices for agricultural commodities. In its efforts to deal with the budget deficit the administration attempted to cut back Federal spending and submitted a balanced budget. In 1953 a moderate recession began, lasting until 1955. The recession was brought to an end by the Revenue Act of 1954, which reduced taxes and eased credit. Eisenhower was also forced to increase Federal spending through aid to highway and school

construction. Although the economy responded favorably and expanded at a modest rate, the farm crisis worsened as huge surpluses developed despite the flexible price-support and soil-conservation programs of Secretary of Agriculture Ezra Taft Benson.

After the elections of 1952, public attention centered increasingly on the activities of Senator McCarthy. Eisenhower was reluctant to enter the McCarthy controversy actively, and the Senator took advantage of the silence of the administration to augment his own power, conducting numerous investigations into alleged Communist infiltration in government agencies, notably the State Department. A number of similar arbitrary investigations were also carried on throughout the nation by local authorities. When McCarthy extended his inquiries to the U.S. Army, his irresponsible methods and accusations prompted the Senate to censure him in December, 1954. In the meantime the Supreme Court moved to correct some of the worst abuses in civil liberties of the postwar period, and several of its rulings limited public investigations into private beliefs and associations.

The most urgent domestic issue of the period lay in the struggle of American Negroes to end segregation and secure their full rights as citizens. Congress had opposed Truman's moderate civil-rights program, and although the Eisenhower administration completed the desegregation of the government and armed forces, it was unwilling to initiate more radical programs. Negroes, led by the National Association for the Advancement of Colored People (q.v.), increasingly turned to the courts for assistance. On May 17, 1954, in the case of *Brown vs. Board of Education of Topeka*, the Supreme Court under Chief Justice Earl Warren unanimously outlawed racial segregation in public schools, thus reversing the principle of "separate but equal" that had been the basis of black-white relations since the *Plessy vs. Ferguson* decision of 1896. Subsequent decisions in 1955–56 called on local authorities to submit plans for desegregation, and also ended racial segregation in intrastate transportation. In many Southern States attempts were made to circumvent these rulings, notably in September, 1957, when Governor Orval Eugene Faubus (1910–) of Arkansas ordered National Guardsmen to prevent nine Negro students from attending Central High School in Little Rock. On Sept. 23, following attacks by whites on Negro students and adults, President Eisenhower dispatched Federal troops to restore order and help the Negro students attend school safely. Despite advances in the bor-

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der States, progress in desegregation was slow in the South, and by September, 1960, only 765 of the 6676 Southern school districts had been desegregated.

Meanwhile, many Negroes were taking an increasingly active role in the civil-rights movement. In December, 1955, the clergyman Martin Luther King, Jr., led a highly effective boycott that resulted in desegregation of the bus system in Montgomery, Ala. In the winter of 1959-60 a form of protest known as the "sit-in" was widely used throughout the South to obtain desegregation of lunch counters and other public facilities. Largely as a result of such activities Congress passed the Civil Rights Act of 1957, establishing a Civil Rights Commission to investigate the denial of voting rights or equal protection of the laws. A subsequent act of 1960 authorized the courts to appoint officials to protect Negro voting rights and made the obstruction of court orders by threat of violence a Federal offense.

Throughout his first administration, whatever the success of his policies, Eisenhower remained an immensely popular figure, although he was unable to transfer his personal popularity to the Republican Party in general; in 1954 it lost control of Congress and did not regain it thereafter. In 1956, despite a heart attack, Eisenhower announced that he would run for a second term. The Democrats, who renominated Stevenson for the Presidency and chose Senator Estes Kefauver of Tennessee as his running mate, campaigned vigorously for a "New America" and for an end to the draft and to tests of the hydrogen bomb. In the balloting Eisenhower carried 41 States. The Democrats, however, retained control of both houses of Congress.

In January, 1957, President Eisenhower submitted to Congress the third consecutive balanced budget of his administration. Early in 1958, a nationwide recession began, and by midyear the downward trend of the economy had assumed major proportions. Unemployment rose in June to over 5,000,000, the highest level since World War II. The reluctance of the administration to move swiftly to curb the recession, as well as evidence of financial corruption within the administration, led to a major Democratic victory in the Congressional elections of 1958. By the end of 1958, the recession had been brought under control, and the value of U.S. manufactures reached the level of the prerecession period. In international finance, however, the excess of U.S. overseas expenditures in relation to its receipts resulted in a di-

minishing of U.S. gold reserves, prompting Eisenhower to order overseas military spending reduced. On Jan. 3, 1959, Alaska was admitted to the Union as the forty-ninth State, and Hawaii was admitted as the fiftieth State on Aug. 21.

In the conduct of foreign affairs Eisenhower relied heavily on his secretary of state, John Foster Dulles. A veteran diplomat, Dulles believed that the "containment policy" was too negative and attempted to replace it with the more dynamic policy of "massive retaliation" to be directed at either Moscow or Peking in case of further Communist aggression anywhere in the world. Dulles hoped to "roll back" Communism by strengthening the forces of anti-Communism everywhere, by "liberating" Eastern Europe, and by using Chiang Kai-shek to recapture China.

The policy of "massive retaliation" implied a reduction in conventional military forces, but placed greater emphasis on nuclear armaments and delivery systems. The so-called arms race, which accompanied the cold war, assumed formidable dimensions when the U.S. exploded the first hydrogen bomb in 1952 and the U.S.S.R. duplicated the feat six months later. Thereafter, while work continued on nuclear weapons and atomic tests, both sides concentrated on perfecting the means of delivering these bombs. New long-range aircraft were developed, and by 1957 both nations had workable intercontinental ballistic missiles; see GUIDED MISSILE. As a result, despite Eisenhower's desire to reduce Federal spending, defense and defense-related spending constituted about 50 percent of the annual budgets of his administration.

Eisenhower's specific accomplishments in foreign policy included the arrangement, on July 27, 1953, of an armistice in the Korean War and the expansion of military and economic aid to the French in Indochina; see INDOCHINA: History. Eisenhower, however, rejected suggestions by Dulles for the tactical use of nuclear weapons and the intervention of U.S. troops in behalf of the French against the Communist-dominated Vietnamese nationalists. An accord reached in Geneva in 1954 (which the U.S. refused to sign) resulted in the partition of Indochina and an eventual intensification of conflict in the region; see VIETNAM: History.

In 1954, in an attempt to prevent further Communist expansion in Asia, Dulles formed the Southeast Asia Treaty Organization (q.v.), which included the U.S., Great Britain, France, Australia, New Zealand, the Philippines, Thailand, and Pakistan. The refusal of other Asian nations to join weakened the pact and prompted Dulles to condemn the neutralist policies of many devel-

oping nations. Nevertheless, Dulles followed a similar strategy in the Middle East, where the Central Treaty Organization (CENTO) was formed in 1955 for the military defense of the region. A further consequence of the setback in Indochina was the strengthening of U.S. ties with Nationalist China, and in January, 1955, Eisenhower obtained Congressional approval for the defense of Formosa and other Chinese islands.

During 1955 a so-called peace offensive by the Soviet Union followed the death of Stalin in 1953. One significant result of this movement was an East-West agreement on Austria, which became fully sovereign but neutral in May, 1955, as Soviet and Western occupation forces were withdrawn. A similar Soviet proposal for Germany was rejected by the U.S. In July, 1955, Eisenhower met with the British, French, and Soviet heads of state at a "summit" conference in Geneva, Switzerland, but no progress was made on the questions of German reunification, disarmament, and other issues. In late 1956, following a denunciation of Stalin by the new Soviet premier, Nikita Sergeyevich Khrushchev, anti-Soviet uprisings occurred in Poland and Hungary, and Khrushchev dispatched Russian troops to suppress the Hungarian revolt. The U.S. condemned this action and admitted many Hungarian refugees to the U.S., but made no effort to intervene directly in the crisis.

Also during this period a major crisis developed in the Middle East. In July, 1956, the U.S., disturbed by apparent Communist influences on the Egyptian government of President Gamal Abdel Nasser, withdrew an offer to extend financial assistance to Egypt for the construction of a dam at Aswân on the Nile R. A week later the Egyptian government assumed control of the Suez Canal (q.v.), which had previously been operated by international authority, and announced that revenues from the operation of the canal would be used to finance construction of the dam. In October, the armed forces of Israel, France, and Great Britain invaded Egypt in order to restore international control of the canal. In the U.N. Security Council, however, the U.S. government moved to censure the invaders and to demand the withdrawal of their troops. Growing fear of Communism in the Middle East led Congress to adopt a joint resolution in March, 1957, providing that U.S. military and economic aid might be supplied to threatened countries in the area who requested help. The resolution, which was intended to supplement other U.S. defensive arrangements, became known as the Eisenhower Doctrine. The

doctrine was subsequently invoked to assist governments in Jordan and in Lebanon, where two battalions of U.S. Marines were landed near Beirut on July 15 and 16 to prevent Communist intervention in a rebellion then in progress in that country.

On Oct. 4, 1957, the Soviet Union launched a 184-lb. earth satellite called Sputnik, and a second Soviet satellite carrying a living dog and weighing 1120 lb. soon followed; see *ASTRONAUTICS: Space Exploration*. The landings won almost universal praise in the U.S. and the rest of the world as outstanding scientific achievements. At the same time, U.S. authorities recognized that the Soviet satellites, besides their propaganda value, reflected significant Soviet advances in the design and construction of rocket-propelled ballistic missiles. The Soviet achievement therefore provoked nationwide debate, and many public figures urged a Congressional probe of alleged American backwardness in rocket and missile research and advocated sweeping reforms in the educational system to increase scientific personnel. The U.S. missile program was intensified, and in January, 1958, the U.S. Army launched the first American earth satellite, Explorer I.

Confrontations with Communist China and the Soviet Union continued throughout 1958. Early in September the Chinese Communists threatened the Nationalist-held islands of Quemoy and Matsu off mainland China. After a prolonged bombardment and repeated threats of invasion by the Chinese Communists, Eisenhower stated that the U.S. was determined to prevent Communist seizure of the islands. In November, Khrushchev demanded that the West negotiate an agreement for the unification of Berlin, proposing that West Berlin be made a "free city" independent of both East and West Germany. He threatened to relinquish Soviet authority in East Berlin to the East German government if a final settlement were not reached within six months, but the proposal was rejected by the West. Tensions eased, however, when Vice-President Nixon visited Russia and Poland in the summer of 1959, and Khrushchev subsequently toured the U.S., agreeing to postpone a settlement of the Berlin question. On May 1, 1960, an American U-2 reconnaissance plane was shot down over Russia while on a spy mission. Two weeks later, at the Paris summit conference, Khrushchev demanded that Eisenhower formally apologize for this violation of Soviet air space. When Eisenhower refused, the conference was terminated. In Latin America, growing resentment against U.S. policies be-

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came especially evident in Cuba, where a revolution led by Fidel Castro resulted in the establishment of a Communist government. When the U.S. refused to grant Castro a loan in 1959, he turned to the Soviet Union for economic assistance, and the Eisenhower administration severed diplomatic relations with Cuba in January, 1961.

In July, 1960, the Democrats nominated Senator John Fitzgerald Kennedy of Massachusetts for President and Senator Lyndon Baines Johnson of Texas for Vice-President. The Republicans nominated Vice-President Nixon for President and U.N. Ambassador Henry Cabot Lodge, Jr., as his running mate. Nixon ran on the record of the Eisenhower administration, whereas Kennedy criticized the conservative tendencies of the Republicans, and promised a "New Frontier". The Presidential campaign was highlighted by a series of television debates between the two candidates. Kennedy was elected, becoming the first Roman Catholic and, at the age of forty-three, the youngest man ever to be elected to the Presidency; Theodore Roose-

velt was forty-two years old when he assumed the office.

THE KENNEDY ADMINISTRATION. In his inaugural address, President Kennedy called for social justice in domestic affairs and for a new era of forceful negotiation in foreign policy. His first economic proposals were designed to counteract the effects of the recession by providing for increased Federal spending and by establishing wage-price guidelines for business and labor. Other measures furnished aid to economically depressed areas and increased the minimum wage for most workers engaged in interstate commerce. To remedy the drain on U.S. gold reserves, caused largely by the continuing unfavorable balance of international trade, the administration imposed a restriction on spending by American servicemen abroad and procured agreements by several foreign countries to advance repayment of various obligations owed to the U.S. Stressing the need for a U.S. trade policy to meet the challenge of the rapidly developing European Economic Community (q.v.), known as the Common Market, Kennedy obtained authorization to cut U.S. tariffs on most imports by 50 percent over five years, and to abolish tariffs on selected goods. Many of his

The administrations of President Dwight D. Eisenhower (right) and his successor John F. Kennedy (left) were also rocked by foreign crises.

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conventional military forces and a further development of U.S. missile systems. In April, 1961, Kennedy authorized an invasion of Cuba by anti-Castro Cuban exiles; the invasion attempt was turned back at the Bay of Pigs on the south coast of the island, and most of the invaders were killed or captured. Kennedy was subsequently confronted with new Soviet demands on Berlin at a meeting with Khrushchev in Vienna, Austria, in June, and in the months that followed Khrushchev revived his demand that Berlin be made a free city. In August he authorized the construction of a wall permanently separating East Berlin from the West. The Soviets also resumed nuclear testing. In response, Kennedy stood firm, placed the U.S. military on the alert, and ordered resumption of U.S. nuclear testing. By 1964 the U.S. had tripled its missile forces.

In Latin America, Kennedy made an effort to reverse the Truman-Eisenhower policy of military rather than economic aid through his program known as the Alliance for Progress, which proposed that Latin-American nations receive at least \$20,000,000,000 to modernize their economies. The Peace Corps (q.v.), created on Sept. 22, was another attempt to improve the U.S. image in Latin America and other areas of the world. It sent teams of young Americans to work directly with people, share their way of life, and assist in such developmental activities as road building and improvement of farming methods.

A major confrontation between the U.S. and the Soviet Union began on Oct. 22, 1962, when Kennedy announced that Soviet-supplied offensive missile bases were being built in Cuba and demanded that the U.S.S.R. dismantle and remove the weapons. At the same time he declared that U.S. naval forces would enforce a quarantine of the island, intercepting and inspecting cargo on ships bound for Cuba to determine whether it included offensive weapons. The O.A.S. nations solidly supported the U.S. stand. For several days war seemed a distinct possibility, but at the end of the week Khrushchev agreed to dismantle the bases and permit U.S. on-site inspection in return for a U.S. guarantee not to invade Cuba. Although Cuba refused to permit the inspection, U.S. aerial reconnaissance revealed that the bases were being disassembled. In late December, prisoners captured during the 1961 invasion attempt were released by Castro in exchange for American food and medical supplies valued at about \$53,000,000.

During 1963, the U.S., capitalizing on a Soviet

desire to ease world tensions in the wake of the Cuban missile crisis and on the deteriorating relations between Communist China and the Soviet Union, renewed negotiations with the latter. On Aug. 5, the U.S., Great Britain, and the Soviet Union concluded a treaty to ban atomic testing in the atmosphere, in space, and underwater. Underground tests, however, were not banned. In addition, a "hot line" for communication between Washington, D.C., and Moscow was installed so that U.S. and Soviet government heads could be in touch with each other directly and quickly in case of an international emergency. During the summer Kennedy visited Western Europe in order to emphasize the interdependence of the U.S. and Europe and to give notice that the U.S. would not relinquish its commitments there.

While relations with the Soviet Union improved, the situation in Southeast Asia deteriorated. At the Vienna conference in 1961 Kennedy and Khrushchev had agreed on the establishment of a neutralist government in Laos; see *LAOS: History*. In South Vietnam, however, increased pressure by the Communist-dominated nationalists known as the Vietcong led Kennedy to expand U.S. military aid for the government of Ngo Dinh Diem. On Nov. 2, 1963, the increasingly unpopular regime was deposed with tacit U.S. approval, and the provisional government established by a military junta received immediate U.S. recognition.

President Kennedy was assassinated on Nov. 22, while riding in a motorcade in Dallas, Texas. He was succeeded by Vice-President Johnson. The suspected assassin, Lee Harvey Oswald (1939–63), was arrested almost immediately. Before he could be questioned about the crime he was himself shot to death by Jack Ruby (1911–67), a Dallas nightclub owner and Kennedy partisan. Because the killing of Oswald and the confusion of reported details on the shooting of the President gave rise to many doubts and rumors of a possible conspiracy, President Johnson appointed a commission headed by Chief Justice Warren to investigate the assassination. The report of the commission concluded that Oswald was the assassin and that he had acted alone.

THE JOHNSON ADMINISTRATION. Vice-President Johnson, who had been in Texas with President Kennedy, took the Presidential oath of office on the plane that subsequently bore Kennedy's body back to Washington, D.C. During his first days in office Johnson conferred with leaders of West Germany, Great Britain, and France after they had attended Kennedy's funeral. On Nov.



President Lyndon B. Johnson, envisioning a "Great Society" for all America, proposed extensive social-welfare measures to war on poverty. UPI

27, he delivered his first Presidential address before Congress, pledging his support for the established lines of foreign policy and urging speedy enactment of the civil-rights and tax bills initiated by Kennedy.

The first months of Johnson's administration were marked by virtually unparalleled legislative activity. In late February, 1964, Congress passed a bill that provided for a substantial reduction in individual income and corporate taxes, to take effect over a two-year period. In August the President secured passage of an extensive anti-poverty program to provide youth-training projects, aid to farm families, community projects, and other means of ameliorating economic distress. A civil-rights law passed on July 2 prohibited discrimination in the use of Federal funds and in public resorts, and set up an Equal Employment Commission to prevent discrimination in employment. The Twenty-fourth Amendment to the U.S. Constitution, ratified on Jan. 23, 1964, prohibited the poll tax as a requirement for voting in Federal elections, and the Voting Rights Act of 1965 aided Negro voter registration. See POLL TAX.

In 1964 the Democrats nominated Johnson as their candidate for President, with Senator Hubert Horatio Humphrey of Minnesota as his run-

ning mate. The Republicans nominated Senator Barry M(orris) Goldwater of Arizona and Representative William Edward Miller (1914-) of New York. In the campaign Johnson amplified his vision of a "Great Society" for America. Goldwater urged a general reduction in the role of the Federal government and advocated a strongly anti-Communist foreign policy. In the election Johnson won, and the Democratic majority was increased in both the Senate and the House.

In January, 1965, Johnson outlined a wide-ranging domestic program. During the year Congress enacted most of his proposals, including aid to education, grants for medical research, housing and urban renewal programs, antipoverty activities, an excise tax cut, Federal enforcement of voting rights, and medical care for the aged. In 1966, however, extended debate resulted in the defeat of a major civil-rights bill forbidding discrimination in housing and of a bill permitting States to enact right-to-work laws. The Senate also voted, in effect, to annul a provision of the 1964 Civil Rights Act that required desegregation of hospitals. In 1966 the

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Supreme Court declared the use of the poll tax as a State voting prerequisite unconstitutional and held that confessions in criminal cases may be invalid unless specific steps are taken to protect the rights of the accused. The Twenty-Fifth Amendment to the Constitution, ratified on Feb. 10, 1967, established procedures for the succession of the Vice-President in cases of Presidential disability.

Negro discontent and impatience became especially evident in the summer of 1965, when a severe riot occurred in Watts, a predominantly Negro section of Los Angeles, Calif. Disturbances occurred in 1967 in more than thirty cities. The President subsequently appointed a commission, headed by former governor Otto Kerner (1908-76) of Illinois, to investigate the causes of these civil disturbances. The report of the commission, issued in 1968, warned of the increasing racial polarization in the U.S.

In foreign affairs, the Johnson administration was confronted by a number of crises, beginning in Latin America. A serious dispute arose between the U.S. and Panama over the control of the Panama Canal, and following anti-American riots in Panama a new treaty for the operation of the canal was negotiated. In 1965 the threat of civil war in the Dominican Republic led Johnson to dispatch 22,000 U.S. troops to that country to protect the lives of U.S. citizens living there and to prevent the establishment of a Communist-dominated government; see *DOMINICAN REPUBLIC: History*. The intervention aroused anti-American sentiment throughout the hemisphere and provoked much criticism within the U.S. Another crisis in the Middle East, followed by a war between Israel and several Arab nations in June, 1967, set off an intensive round of diplomatic maneuvers that culminated in a meeting in June of President Johnson and Soviet Premier Aleksei Nikolayevich Kosygin at Glassboro, N.J. In response to Soviet aid for the Arab nations, and growing Soviet influence in the Mediterranean, the U.S. increased its military aid to Israel.

Johnson's principal problem in foreign affairs was the war in Vietnam. During 1964, he continued Kennedy's policy of sending military "advisers" to assist the military forces of South Vietnam, but undertook no further escalation of the conflict. In the Presidential elections of 1964, Senator Goldwater advocated increased American involvement, including the bombing of North Vietnam, and Johnson opposed further escalation of the war. In the same year, however, Johnson reported an attack by the North Vietnamese on American vessels in the Gulf of

Tonkin, and the Senate passed a resolution authorizing the President to increase U.S. military involvement in Southeast Asia. By 1967, the U.S. was bombing virtually the whole of North Vietnam and had committed over 500,000 troops to the war. Johnson's policy of escalation precipitated a great public debate at home, which was intensified in January, 1968, during the so-called Tet offensive, when the North Vietnamese interrupted a temporary truce with a series of offensive strikes. The American commander, General William Childs Westmoreland (1914-), thereupon called for an additional 206,000 troops. Johnson, responding to critics of the war within his own administration and throughout the U.S., refused the request and subsequently relieved Westmoreland of his command. Another Asian crisis also occurred in January when the U.S. intelligence ship *Pueblo* was seized by naval forces of North Korea. After a series of lengthy negotiations the crew was released late in 1968.

Reflecting increasing dissatisfaction with Johnson's conduct of the war, Senator Eugene J. McCarthy (1916-) of Minnesota announced his intention to challenge the President for the 1968 Democratic Presidential nomination. In the primary election in New Hampshire in February, 1968, McCarthy received 44 percent of the vote against a candidate representing Johnson. McCarthy's surprisingly strong showing was taken as an indication of the strength of the antiwar movement and was followed by an announcement by Senator Robert Francis Kennedy of New York that he too would become a Presidential candidate. On March 31, in a television address, Johnson announced that he was suspending the bombing of North Vietnam as a means of furthering negotiations for the conclusion of the war, and that he would not be a candidate for the Presidency in 1968. His administration was thereafter marked by a number of domestic disorders. The assassination of Martin Luther King on April 4 in Memphis, Tenn., precipitated a new wave of riots in Washington, D.C., and several other cities. Severe disturbances by students at Columbia University and other educational institutions aroused considerable controversy over the use of police to control such disturbances. On June 5 Robert Kennedy was shot after winning the Democratic primary election in California. His death on June 6 provoked a debate on the increasing role of violence in American society, and Johnson appointed a commission, chaired by Milton Stover Eisenhower, to investigate the causes of this violence. Like the Kerner Commission, this body

In the early 1970's the depressed state of the nation's economy became a major issue. President Richard M. Nixon (left) recommended new revenue-sharing legislation under which Federal taxes would partly be redistributed to local governments. New York State Governor Nelson Rockefeller (center) and cabinet member George Romney (right) favored the plan.



attributed the increasing violence to continuing social injustice and racial polarization and called for extensive reforms in U.S. society.

At the Republican national convention in August, Richard Nixon was nominated for President, with Governor Spiro T. Agnew of Maryland as Vice-Presidential candidate. The Democratic convention in Chicago was marked by conflicts between supporters of Johnson's policy and critics of his administration. Vice-President Humphrey received the Presidential nomination, and Senator Edmund Muskie (1914-) of Maine was selected as the Vice-Presidential candidate. In the election, Nixon, calling for a restoration of social stability, won with some difficulty. A third candidate, former Governor Wallace of Alabama, running largely on regional issues, emerged as the head of the newly formed American Independent Party.

End of the Postwar Period. As 1970 approached, the postwar period seemed definitely to be coming to an end. A new generation had reached maturity. Europe was financially recovered from the war. The two superpowers, the U.S. and the U.S.S.R., were engaged in a readjustment of their relations with each other and with their allies. And a third great power, the People's Republic of China, had begun to play a more active role in world affairs. For recurring issues and problems, see DISARMAMENT; POVERTY; SOCIAL LEGISLATION; VIETNAM, WAR IN.

THE NIXON ADMINISTRATION. When President Nixon took office in 1969, his approach to domestic affairs was similar to that of President Eisenhower. Calling his program "The New Federalism", he sought to limit the power of the Federal government and to aid State and local authorities in fulfillment of their responsibilities. Accordingly, one of Nixon's first legislative proposals was a revenue-sharing program by which Federal taxes would partly be redistributed to State and local governments to help them cope with their mounting financial problems. The President also recommended a drastic

reorganization of welfare programs and proposed the establishment of a minimum Federal standard of welfare assistance. To counteract the inflation that had developed during the 1960's, he called for a reduction in government expenditures but for about two years rejected suggestions for wage and price controls.

His interest in law and order was expressed in his appointments to the Supreme Court and in crime legislation. The Court had two vacancies in Nixon's first year in office. To replace the retiring Earl Warren, he nominated Warren Earl Burger of Ohio, a judge on the District of Columbia Court of Appeals, who took office as Chief Justice of the U.S. in June, 1969. His first two nominations for the seat vacated by Associate Justice Abe Fortas were defeated in the Senate, but Harry Andrew Blackmun of Minnesota, a judge on the U.S. Eighth Circuit Court, was confirmed on May 12, 1970. The resignations of Justice Hugo La Fayette Black and John Marshall Harlan (see *under* HARLAN) in 1971 gave Nixon the unusual opportunity to select another two justices. Lewis F. Powell, Jr. (1907-), a Virginia lawyer, and William H. Rehnquist (1924-) of Arizona, an assistant U.S. attorney general, were approved late in the year. The President considered his four appointees "strict constructionists" who would restrict their rulings to the judicial interpretation of the Constitution without attempting to make the Court an arbiter of the social and economic patterns of the country.

The passage of the administration-sponsored Organized Crime Control Act and the Omnibus Crime Control and Safe Streets Act of 1970 met many of the objections of police officers who had felt unduly restricted by the protection for the rights of the accused that resulted from earlier Supreme Court decisions.

Government reorganization proceeded at an uneven pace. In 1970 the first postal strike in American history was followed by the organization of the Postal Service (q.v.) to replace the

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180-year-old Post Office Department. To meet increasing problems of air and water pollution and of general atmospheric conditions, the National Oceanic and Atmospheric Administration (q.v.) was established in the Commerce Department in October, 1970, and the Environmental Protection Agency was set up in December. The Office of Consumer Affairs was established in February, 1971, to coordinate Federal programs of consumer protection; see CONSUMER EDUCATION AND PROTECTION.

The U.S. program of space exploration was marked by several major accomplishments during the Nixon administration, notably the first manned landing on the moon, by the crew of Apollo 11, on July 20, 1969, after many years of painstaking preparations; see ASTRONAUTICS.

Early in his administration the President outlined a foreign policy based on a "low profile" and on reductions in the U.S. role abroad. Yet continued war in Vietnam, and the activities of foreign governments, touched domestic life at many points. Inflation continued; wages and prices spiraled although many economists argued that the rate of price increases exceeded the rate of wage increases. The cost of military equipment for allies abroad in NATO and in Asia made money short for domestic programs.

The interwoven quality of domestic and foreign affairs marked the 1970 elections to Congress. Despite vigorous personal campaigning, President Nixon and Vice-President Agnew were unable to upset the Democratic majority in the House or Senate; and the Republicans also lost eleven governorship elections. The Ninety-Second Congress set its own priorities. Among its attempts to limit the warmaking powers of the President was a campaign against extension of Selective Service (q.v.).

In the U.S., rising civilian dismay with the Vietnamese conflict led to many-sided protests, frequently resulting in direct confrontations between the demonstrators, often college students, and National Guardsmen. After the U.S. incursion into Cambodia in search of Communist sanctuaries, students at Kent State University, in Ohio, demonstrated in May, 1970, and four of them lost their lives. Ultimately, 500 campuses experienced student strikes and were closed for a considerable time. The police throughout the nation faced accusations of brutality that seldom proved conclusive upon investigation, in the few cases in which local authorities instituted such proceedings. Many public buildings were bombed, notably the U.S. Capitol in March, 1971, and bomb threats and arson were not uncommon.

President Nixon announced that he intended to "wind down" the war through a policy of "Vietnamization" or replacement of American troops by South Vietnamese troops American-trained and -equipped to withstand their North Vietnamese and Vietcong enemies. Nixon withdrew more than 350,000 American troops from the war zone; by the end of 1971 fewer than 175,000 remained. The peace talks that had been instituted by President Johnson at Paris were continued, with no result, and the Communists continued in their refusal to discuss the freeing of American captives. Congress, nevertheless, attempted to make the President move faster. The Gulf of Tonkin resolution (see *The Johnson Administration*, above) was withdrawn in November, 1970, and by various parliamentary means Congress tried to limit funds for conduct of the war. Nixon ordered the resumption of large-scale bombing of supply trails and anti-aircraft defenses in North Vietnam late in 1971.

In the Middle East the uneasy peace was frequently broken by Arab guerrilla adventures and Israeli counterthrusts in full force. But Egyptian-Israeli confrontations across the Suez Canal reached only minor proportions because the parties largely observed a cease-fire, beginning in August, 1970, arranged at the urging of U.S. negotiators. Soviet missiles were added to Egyptian defenses, but the U.S. did not add substantially to Israeli equipment.

Relations with the U.S.S.R. improved in the opinion of some political observers. The Strategic Arms Limitation Talks (SALT), begun in 1969, continued into 1972. In May, during President Nixon's state visit to Moscow, two agreements between the U.S. and the U.S.S.R. were signed. One agreement limited antiballistic missile systems, and the other put restrictions on offensive missile launchers. See DISARMAMENT: SALT.

An agreement for unlimited access through East Germany to West Berlin was negotiated by France, Great Britain, the U.S., and the U.S.S.R. in the summer of 1971. Meanwhile, the U.S. had signed treaties calling for the nonproliferation of nuclear weapons in November, 1969, and for the banning of nuclear weapons, and testing of them, on the ocean floor, on Feb. 11, 1971.

President Nixon resumed the personal diplomacy of recent Presidents. He traveled to Rumania and other countries soon after his inauguration; he went to Italy, Yugoslavia, Spain, and other countries in the fall of 1970; and he met the emperor of Japan in Alaska in September, 1971. But he left his most ambitious efforts for later. In July, 1971, Henry A. Kissinger, Nixon's adviser on national security, went secretly to Pe-

king to arrange a meeting between the President and the leaders of the People's Republic of China. President Nixon went to Peking in February, 1972, and parts of his visit were transmitted by television throughout the world. According to the President, "there were no secret deals" but the two countries did agree to "expand cultural, educational and journalistic contacts" and "to begin and broaden trade".

The October, 1971, meeting of the U.N. brought a breach in U.S. relations with Asian allies. Once the Nixon visit to Peking was announced, the members of the U.N. felt no longer constrained to keep Communist China from occupying the Security Council seat allotted to China. Despite an attempt to keep the Nationalist Chinese representatives in the U.N., the U.S. was defeated; and Taiwan was expelled from all U.N. organizations.

At the end of 1971 a brief war between India and Pakistan over the autonomy of East Pakistan reemphasized the differences in international policies of the U.S.S.R. and the U.S., who backed India and Pakistan, respectively, and damaged U.S. relations with India. See BANGLADESH.

Domestic and foreign relations were again intertwined in the summer of 1971. In June the administration clashed with several major newspapers on its right to enforce "prior restraint", or censorship, on their publication of the so-called Pentagon papers, excerpts from a classified secret Defense Department history of U.S. participation in the war in Vietnam. The newspapers, primarily *The New York Times* and the *Washington Post*, claimed the protection of the First Amendment and declared it their "public duty" to publish the information on the reaching of decisions concerning the Vietnamese involvement. Government-obtained injunctions were appealed to the Supreme Court, and the justices voted 6-to-3 that the government was unable to stop publication of any information, no matter how embarrassing diplomatically, when national security was not involved. Criminal prosecution for violation of the espionage act and for theft of government property was started immediately against Daniel Ellsberg (1931-), a former civilian employee in the Defense Department, who was one of the compilers of the history and had admitted supplying the documents to the newspapers.

In July, 1971, the country passed a 20th-century milestone. For the first year in the century it appeared that in 1971 the U.S. would import more merchandise than it exported, and consequently it faced a severe deficit in its balance of

payments. A Federal budget deficit of about \$20,000,000,000 was projected for fiscal 1971. In August, a crisis in world monetary stability was evident, and the value of the dollar was threatened for the second time in a year.

On Aug. 15, President Nixon announced a new economic policy to aid the American economic position at home and abroad. Reversing his previous refusal to impose price and wage controls, he announced a three-month freeze on wages, prices, and rents. He suspended redemption of dollars in gold and imposed a 10 percent surcharge on imported goods. He established a Cost of Living Council to set up guidelines for labor and management and to establish machinery for enforcement.

Abroad, the monetary exchanges were temporarily thrown into confusion, but trading resumed, and revaluations were achieved by "floating" certain currencies, among them the Japanese yen and the West German mark. Finally, after a meeting of the International Monetary Fund and hard bargaining within the so-called Group of Ten—ten major industrial nations—the U.S., in December, agreed to raise the price of gold slightly and, for the first time since the 1930's, to devalue the dollar by about 8.6 percent. The import surcharge was rescinded at the time. The dollar was devalued by another 10 percent in February, 1973.

The end of the ninety-day freeze in November, 1971, was followed by the institution of a program of controlled increases in prices, wages, and rents, called Phase II. A Pay Board and a Price Commission were set up to establish guidelines and oversee compliance to reduce inflation. In January, 1973, Phase III of the economic program was begun. Price and wage increases were allowed, but the government retained sufficient power to intercede if actions went beyond prescribed guidelines.

Meanwhile, on Nov. 7, 1972, President Nixon won reelection in an overwhelming victory over the Democratic Party candidate, Senator George S. McGovern (1922-). **South Dakota** The President received 510 electoral votes, McGovern 17 (Massachusetts and the District of Columbia). In this election, eighteen-year-olds were allowed to vote for the first time, after the Twenty-Sixth Amendment to the Constitution of the U.S. (q.v.) was ratified on June 30, 1971. **Nixon's Second Term.** As President Nixon's first term ended and his second began, two former Presidents died: Harry S. Truman on Dec. 26, 1972, and Lyndon B. Johnson, Jan. 22, 1973. Late in December, 1972, the last planned U.S. mission to the moon, Apollo 17, was concluded.

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An event that was received with a sense of relief and thankfulness by the people of the U.S. was the signing, on Jan. 27, 1973, of a cease-fire agreement in Paris, France, making possible the withdrawal of American forces from Vietnam (q.v.), and temporarily suspending the longest and most controversial war in U.S. history. In June, 1973, Selective Service was suspended and a policy of volunteer recruitment was instituted.

On the economic front, the unabated rise in the cost of living (q.v.) caused serious concern throughout the nation. The government's wage and price program was revised on June 13, 1973, essentially a reimposition of a freeze on prices and wages, first established in August, 1971. Phase IV, announced on Aug. 13, 1973, relaxed price and wage controls in some industries and imposed controls in others. It expired April 30, 1974, leaving only the petroleum industry controlled.

In foreign affairs, the policy of détente between the U.S. and the Soviet Union was continued. Leonid Brezhnev and President Nixon exchanged visits in 1973 and 1974. They signed agreements calling for joint cooperation in oceanography, transportation, agriculture, and expanded cultural exchange programs. Détente suffered a setback in October, 1973, during a renewed outbreak of Arab-Israeli hostilities, when the Kremlin supported the Arabs and the U.S. supported Israel. The two superpowers cooperated, however, in bringing about a cease-fire and disengagement of forces agreements between Israel and the Arab Republic of Egypt in January, 1974, and between Israel and Syria in May. United States Secretary of State Henry Alfred Kissinger (q.v.) played a major role in achieving these settlements.

Shortly after the inauguration in January, 1973, revelations rapidly mounted concerning an illegal wiretap and attempted burglary of the national headquarters of the Democratic Party in the Watergate (q.v.) building complex, in Washington, D.C., on June 17, 1972. Five men working for the Committee for the Re-election of the President were arrested on the scene. The subsequent indictment, trials, and investigations implicated high members of the Nixon administration in the planning of the break-in. The name Watergate became synonymous with a whole series of illegal, unethical, and irregular acts committed by members of the Administration. The U.S. was faced with a series of political and economic crises in the next few years. Vice-President Agnew resigned on Oct. 10, 1973, after indictment for evasion of Federal income taxes. Succeeding him, Gerald R(udolph) Ford (q.v.)

was sworn in as the fortieth Vice-President on Dec. 6, 1973.

In the summer of 1974 President Nixon was faced with imminent impeachment (q.v.) for his own part in Watergate. He resigned on Aug. 9, the first President of the U.S. to do so. Ford, who succeeded him immediately, was the first to serve without having been elected.

The Ford Administration. One of Ford's first official actions was to pardon Nixon, on Sept. 8, in what he intended to be a means of putting Watergate and its divisiveness behind the U.S. He was partially successful in restoring confidence in the Presidency, but several months passed before Congress confirmed Nelson A(ldrich) Rockefeller (*see under* ROCKEFELLER) as the forty-first Vice-President, and he was sworn in on Dec. 19, 1974.

The worldwide recession was deepening, and the U.S. was experiencing its highest unemployment and inflation rates in decades. An embargo on oil shipments to the U.S. and other industrial nations had been imposed by the Organization of Petroleum Exporting Countries (q.v.) in the winter of 1973-74, and oil prices had quadrupled in a few months, intensifying the international monetary crisis; *see* PETROLEUM. The impetus toward peace in the Middle East had slowed, and an outbreak of hostilities in Cyprus (q.v.) in 1974 threatened the existence of NATO as two of its members, Greece and Turkey, opponents in Cyprus, suspended cooperation with the organization.

Meanwhile, the sudden escalation of war in Vietnam, Laos, and Cambodia, and the virtual expulsion of the U.S. from Southeast Asia in the spring of 1975, weakened confidence in U.S. strength and loyalty to its allies.

Ford was unable to win approval for his legislative programs to fight inflation and increase energy resources as he contended with an overwhelmingly Democratic Congress, the result of the 1974 midterm elections. He continued to support Secretary Kissinger's "shuttle diplomacy" in the Middle East, but in June, 1975, he assumed a new diplomatic initiative of his own. Traveling to Europe, he conferred personally with European heads of state, as well as with President Anwar el-Sadat of Egypt.

In 1975 the U.S. began to emerge from the recession that had begun in 1973. The country's unemployment rate remained high, however, and many automobile and construction workers were without jobs. Some State and local governments had difficulty balancing their budgets; New York City, for instance, needed Federal assistance to remain solvent.



After reaching agreement on a framework for a Middle East peace settlement at the Camp David conference in early September, 1978, Egyptian President Anwar el-Sadat, U.S. President Jimmy Carter, and Israeli Prime Minister Menachem Begin seal the accord with a historic handshake.

Wide World

Carter Elected. In July, 1976, Jimmy Carter (q.v.), a former governor of Georgia and a newcomer to national politics, gained the Democratic Presidential nomination. In the November elections Carter and his running mate, Senator Walter F(rederick) Mondale (q.v.) of Minnesota, narrowly defeated the Republican candidates, President Ford and Senator Robert J. Dole (1923–) of Kansas. The Democrats maintained their strong majorities in the U.S. Senate and House of Representatives.

Following his low-key inauguration in January, 1977, Carter drew up a wide-ranging legislative program, much of which received severe criticism in Congress. In April the President offered a package of complicated legislation designed to reduce the nation's consumption of petroleum by encouraging the use of power sources like coal and solar energy. The Senate altered much of the package, which was finally passed in November, 1978. Carter had some success in his effort to streamline the Federal bureaucracy, however, and in October, 1977, a new Department of Energy (q.v.) began operations. The national unemployment rate fell, but the rate of inflation increased. As prices increased, so did taxes. California voters responded by passing Proposition 13, a legislative initiative that sharply reduced property taxes in the State, and many persons in other parts of the nation also called for lower taxes.

In September, 1977, the President signed treaties giving Panama control of the Panama Canal by the year 2000; after heated debate, the treaties were ratified by the Senate in early 1978. In September, 1978, Carter hosted a meeting at Camp David, Md., where he helped arrange a peace treaty between Israel and Egypt. In 1979 the U.S. established full diplomatic relations

with China and concluded a second SALT agreement with the Soviet Union.

Meanwhile, the economic situation deteriorated. As U.S. imports continued to exceed exports, the value of the dollar declined, and the annual inflation rate rose to more than 10 percent. By the summer of 1979, the country was in the midst of a new recession, and gasoline shortages were making the so-called energy crisis proclaimed by Carter a reality for most Americans.

UNITED STATES STEEL CORPORATION, Delaware-incorporated steel-manufacturing enterprise, organized in 1901, chiefly through the efforts of the Chicago jurist and industrialist Elbert Henry Gary (q.v.). The original members included the Federal Steel Company, the Carnegie Steel Company, and eight other firms. With a capitalization of more than \$1,000,000,000, U.S. Steel, as it is generally known, was then the largest industrial corporation in the world. It was also the first American steel company that was engaged in the entire process of steel-making, from the mining of raw materials to the marketing of finished steel products. Today, U.S. Steel makes and sells more than 10,000 types of steel products, and it also produces and markets plastics and chemicals.

In recent years U.S. Steel produced about 24 percent of the total annual U.S. raw-steel production—about 31,400,000 net tons. In 1971 U.S. Steel ranked eleventh among American industrial firms in total assets (\$6,400,000,000) and thirteenth in dollar volume of sales (\$4,900,000,000). Annual employment totaled about 184,000

persons. Corporation shares outstanding in 1971 numbered 54,769,462 held by some 343,850 stockholders. The firm maintains headquarters in Pittsburgh and New York City, and currently has financial interests in steel processing and producing facilities in Central America and in Europe.

UNITY or UNITY SCHOOL OF CHRISTIANITY, nondenominational religious fellowship or educational institution. It was founded in 1889 by an American clergyman and educator, Charles Fillmore (1854-1948), and his wife, Myrtle Fillmore (d. 1951) on a basis of teachings from Christian Science, New Thought, Theosophy, Hinduism, and other systems. It presents a curative treatment for physical and other ailments, but it does recognize the reality of illness. Although organized in many ways that suggest the structure of a church body, the fellowship denies any intention of forming a separate denomination, and members retain their original denominational affiliations. The school is located near Kansas City, Mo., and is allied with the Association of Unity Churches. The major work of the group is the preparation of educational materials and of answers to personal requests for consultation.

UNIVERSAL DECLARATION OF HUMAN RIGHTS, resolution adopted unanimously in December, 1948, by the General Assembly of the United Nations (q.v.). The objective of the thirty-article declaration is to promote and encourage respect for human rights and fundamental freedoms. The declaration proclaims the personal, civil, political, economic, social, and cultural rights of man, which are limited only by recognition for the rights and freedoms of others and the requirements of morality, public order, and general welfare. Among the rights cited by the declaration are the rights to life, liberty, and security of person; to freedom from arbitrary arrest; to a fair trial; to be presumed innocent until proved guilty; to freedom from interference with the privacy of one's home and correspondence; to freedom of movement and residence; to asylum, nationality, and ownership of property; to freedom of thought, conscience, religion, opinion, and expression; to association, peaceful assembly, and participation in government; to social security, work, rest, and a standard of living adequate for health and well being; to education; and to participation in the social life of one's community.

The declaration was conceived as the first part of an international bill of rights, that was under preparation, after 1947, by the U.N. Commission on Human Rights. The bill is designed to be enforceable eventually in courts through-

out the world as a kind of world law. The General Assembly in 1955 authorized two draft covenants, with measures of implementation. One of the covenants relates to civil and political rights, the other to economic, social, and cultural rights. In December, 1966, both of the completed covenants, plus an optional protocol on civil and political rights, were opened for signature at the U.N. The two covenants have been signed by forty-four nations, and the optional protocol by sixteen. To be implemented, the covenants must be ratified by thirty-five nations and the protocol by ten. By 1969, both covenants had been ratified by Colombia, Costa Rica, Cyprus, Ecuador, Syria, and Tunisia, and the protocol by Costa Rica and Ecuador. Other signatories continued to study the complexities of adjusting national legislation to conform with the documents, before ratification.

J.A.J. & K.M.

UNIVERSALISM, religious faith incorporating many Christian tenets, but not exclusively Christian. Its adherents believe in universal salvation, or, as it is now generally stated, in the eternal progress of all souls. Modern Universalists claim that this doctrine is contained in the New Testament in the teachings of Jesus, and conforms with the laws of nature as taught by science and sanctioned by reason and philosophy.

About 1750 an organization calling itself Universalist was created in London. Before that time the believers in universal salvation were affiliated with sects bearing various names and were known as, among other names, Origenists and Merciful Doctors. In the United States, the most important early leader was a British opponent of Calvinism, John Murray (1741-1815), who began preaching in New Jersey in 1770. He formed the first organized Universalist church in America, the Independent Christian Church of Gloucester, Mass., in 1779. Another influential leader was Hosea Ballou (q.v.), a New England schoolteacher and clergyman. At the present time very few churches in Europe bear the Universalist name, but the doctrine of Universalism finds favor and in some instances open advocacy in churches of various names. Many Unitarians in Europe are avowed Universalists, just as the Universalists of America are generally Unitarians. The sect has at various times become subdivided, chiefly by the breaking away of the Restorationists in 1831. The group was dissolved a decade later. They maintained that the wicked would pass through a temporary state of punishment after death, whereas the original Universalists maintained that for sin there is no punishment, except the conse-

quences in this life. Statements of Universalist principles have been formulated at various times, at Philadelphia in 1790, in the Winchester Profession of 1805, at Boston in 1899, and at Washington, D.C., in 1935. In general, these statements agreed on a refusal to adopt any specific creed; see CREEDS. A final statement was made in the 1942 charter of the Universalist Church of America, in which the group adopted the principle of promoting "harmony among adherents of all religious faiths". Their work is largely humanitarian, among underprivileged groups in the U.S. and elsewhere.

They joined with the American Unitarian Association in 1961 to form the Unitarian Universalist Association; see UNITARIANISM. In that year, they reported 68,949 members in 334 churches.

UNIVERSALIST CHURCH OF AMERICA. See UNITARIANISM; UNIVERSALISM.

UNIVERSAL LANGUAGE. See LANGUAGE: *Universal Language*.

UNIVERSAL POSTAL UNION, specialized agency of the United Nations (q.v.), consisting of 142 member states and territories united in a single postal territory for the reciprocal exchange of correspondence. Nearly all independent nations, nonself-governing territories, and trust territories are members. The union implements the provisions of the Universal Postal Convention, adopted in 1874, which specifies the types of correspondence that may be transmitted internationally; prohibits mailing of certain articles and commodities, such as narcotics; provides for the redirection or return of correspondence that cannot be delivered; regulates payments when the mail goes through the territory of several members; and guarantees freedom of transit throughout the entire territory of the Union.

The organization was established in 1875 as the General Postal Union by the provisions of the convention. The present name was adopted in 1878, when the union became open to membership by the unilateral decision of any country wishing to join. The 12th Universal Postal Congress, held in Paris in 1947, made the union a specialized agency of the U.N. After July, 1948, countries wishing to join the union required the approval of two thirds of the member countries.

J.A.J. & K.M.

UNIVERSALS. See NOMINALISM.

UNIVERSE. See COSMOGONY. See also ASTRONOMY; EXPANDING UNIVERSE; STARS.

UNIVERSITIES AND COLLEGES, degree-granting institutions of higher learning. A university, in the original sense, is a corporate body de-

voted to study, teaching, and investigation. A college may be either affiliated with a university or independent. See EDUCATION, HIGHER.

The American university is an advanced educational institution consisting of general and specialized schools or colleges. The larger universities have undergraduate colleges of liberal arts and sciences, a graduate school, and several professional schools, such as law, medicine, and engineering. The undergraduate colleges offer courses of instruction leading to bachelor's degrees. In addition, similar independent colleges exist that have no university affiliation. One college, Bryn Mawr, offers graduate studies leading to the doctoral degree.

In Europe the university has faculties, or colleges, of philosophy, law, medicine, and theology. The faculty of philosophy may be split into humanistic and scientific divisions. A European institution of higher learning generally offers a doctor's degree or a diploma, and pays no attention to attendance and course grades in most cases. The American college offers and usually requires general education before specialization, but the European begins directly with specialized study, because the student has completed his general education in secondary school. See EDUCATION, SECONDARY.

Eastern Institutions. The university is directly related to the institutions of higher learning that evolved in western Europe during the Middle Ages. Yet, significant types of higher learning were known in ancient times. In Greece, the Academy of Plato (q.v.) and the Lyceum of Aristotle (q.v.) were advanced schools of philosophy; see ACADEMY. During the Hellenistic period, which began in the 4th century B.C., Athens attracted many Roman students of philosophy. Among later Romans who studied at Athens were Julius Caesar, Cicero, Augustus, and Horace (qq.v.), and students came from other areas throughout the period. The later University of Athens was closed down in 529 A.D. by Emperor Justinian I (q.v.) because it was a pagan center within a rising Christian religious culture.

Also important in the Hellenistic period was Alexandria, in Egypt, with its great library and museum, which brought together teachers and students from all areas. Pergamum and Antioch (now Antakya, Turkey), in Asia Minor, also possessed notable libraries. The Jewish academies in Palestine and Babylon, which produced the Talmud (q.v.), promoted intellectual study from about 70 A.D. through the 13th century.

The University of Nalanda, in North India, which taught Buddhism to native and Chinese students, functioned until about the 13th cen-

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turn. The Al-Azhar University in Cairo, Egypt, now over 1000 years old, remains the central authority for the Islamic religion. Another Muslim institution dating from about the same period is the Al Qarawiyn University in Fez, Morocco, founded in the middle of the 9th century A.D. Higher education flourished in China from the 7th century and in Korea from the 14th century.

Medieval Universities. Western European higher education started in a formal, organized manner with the migration of students to places where great teachers were lecturing on subjects of concern to them. By the 12th century, higher-learning centers were founded at Paris for teaching theology and philosophy; at Bologna, Italy, for law; and at Salerno, also in Italy, for medicine. The University of Paris became the model for later universities in northern Europe, and the University of Bologna, for the universities in Italy and Spain. The word "university" is an abbreviation of *universitas magistrorum et scholarium*, meaning "a guild or union of masters and students", organized for mutual protec-

tion. The medieval universities had the right of closing down (*secessio*) when conditions were not favorable in the town; and of conferring degrees, including the privilege of teaching in any Christian country (*ius ubique docendi*).

Universities were founded beginning in the 13th century in France, England, Germany, Spain, Bohemia, Poland, and other European countries. Students were able to migrate from one to another in search of a particular professor or subject. This was possible because Latin was the universal language of lecturing. Students from a particular country organized themselves into a so-called nation for mutual aid and protection.

The Renaissance and the Reformation. The Italian universities, such as Ferrara, helped transmit the humanistic ideas of the Renaissance to German and other universities of northern Europe. During the 17th century, the University of Bologna was the European center for medicine and biology. An important center for the new science was the University of Leyden in Hol-



Reunion of the faculty at the University of Paris (from a miniature in the Bibliothèque Nationale, Paris).

Bettmann Archive



Lecture at Bologna university (engraving after a 15th-century miniature by Laurentius de Voltolina).

Bettmann Archive

land, founded in 1575, which attracted students from all over Europe. Modern ideas were advanced at the University of Paris, a very traditional institution, when the French philosopher Petrus Ramus (q.v.) launched an attack (about 1543) upon the doctrines and methods of Aristotle.

The University of Wittenberg was the scene of the Protestant Reformation started in 1517 by Martin Luther (q.v.), a professor, whose disciples taught in all parts of Germany, Scandinavia, and eastern Europe. Both the Catholic Counter-reformation and the Calvinist Reformation in Switzerland involved the work of the universities. The University of Dillingen (later superseded by the University of Munich) in Germany helped promote Catholicism in central and eastern Europe. Salamanca was the mother of the universities established in the 16th and 17th centuries in Central and South America. Among the Protestants, the University of Geneva helped spread the doctrines of John Calvin all over Europe and North America.

The 17th and 18th Centuries. The Calvinists in New England founded Harvard College in 1636, following the example of Emmanuel College at Cambridge University. Other Calvinist

colleges in colonial America were Yale, Princeton, Rutgers, and Dartmouth. The American institutions were first colleges, rather than universities. Students were under the charge of resident teachers or masters, who taught the entire class. Later, American higher education developed on the Continental European plan, which was resident. During the 18th century, Oxford and Cambridge were at a very low point academically, but they still attracted American students to study medicine, inasmuch as such instruction was not yet available in the colonies. Colonial Americans also attended universities in Scotland, Holland, France, and Italy.

The first institution of higher secular learning in Russia was the University of Moscow, founded in 1755 by the scientist Mikhail Vasilievich Lomonosov (1711–65), which developed, along with other Russian universities, under German and other foreign influences.

European Universities in the 19th and 20th Centuries. During the 19th century, German universities became influential sources of scholarly research and examples of academic free-

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dom (q.v.). The University of Berlin was noted for philosophy; Göttingen for literature and mathematics; Heidelberg for mathematics and the classics; Leipzig for psychology; and Jena for pedagogy. Many students from foreign countries, including America, obtained their degrees of doctor of philosophy from German universities.

The universities of Durham and London, founded in 1832 and 1836, respectively, were the first new English institutions since the Middle Ages. During the 20th century, the University of London grew into a large organization of schools, institutes, and colleges, and became a central examining body for the British Commonwealth of Nations.

Russian universities grew in number and influence in the 19th century, and until the Revolution of 1917 they offered studies in the classics, science, Russian literature, and history. They also were centers of radical and revolutionary political doctrines and activities. The government periodically withdrew academic privileges and imprisoned faculty members and students, but this control could not stem the tide of revolutionary thought.

COLLEGES AND UNIVERSITIES IN THE UNITED STATES

Some time before the end of the colonial period, the American college began to modify its religious character. Medicine, law, modern languages, and sciences were introduced before 1800. The statesmen Benjamin Franklin and Thomas Jefferson (qq.v.) as well as others helped make the college secular and modern. Among the new institutions of the young republic was the State University of North Carolina, founded in 1789. In the Dartmouth College Case of 1819, the United States Supreme Court ruled that a State cannot unilaterally change a charter. This decision led to the founding of both private denominational colleges and State universities. During the 19th century, the process of secularization of the American college was slow, but after 1900 many American colleges and universities became nonsectarian and secular.

New fields of study in the sciences and the social sciences, and in modern foreign languages, were introduced in the 19th century. Engineering, law, medicine, dentistry, and other professional fields were taught in the universities and in special schools; see **EDUCATION IN THE PROFESSIONS**. Graduate study leading to the degree of doctor of philosophy was introduced at Yale and other institutions after 1861, and the first real American institution of higher learning,

the Johns Hopkins University, was founded in 1876. The Morrill Act, passed by Congress in 1862, aided agriculture and engineering and helped the growth of State universities in the Middle West and the Far West; see **LAND-GRANT COLLEGES**.

Modern Trends. Many recent critics of U.S. higher education have complained of superficial and too-practical content in the college curriculum, the neglect of the intellect, and the excessive emphasis on competitive athletics and other trivial matters that has resulted in the decline of scholarship and in other weaknesses. On the other hand, it is clear that the American college and university have given many opportunities to young people to advance their educational competence through junior and community colleges, general education, and other means. In the late 1960's about 5,250,000 students, full time and part time, attended some 1100 accredited colleges and universities annually. Largely because of the Fulbright Act (see **FULBRIGHT, JAMES WILLIAM**) and subsequent legislation, the U.S. in 1967 attracted more than 100,000 students from some 170 countries to its higher educational facilities.

The major European universities are also international centers of higher learning. Oxford, Cambridge, Paris, and many universities in other European countries have large foreign student bodies. The Soviet Union, in the 1920's, offered advanced political training in Communist universities designed for students from various areas of the world. In October, 1960, the Soviet Union established in Moscow the Lumumba University of the Friendship of Peoples to train students from the developing countries of Latin America, Asia, and Africa.

New universities opened in the 1950's and 1960's with increasing frequency in the industrial nations, such as Great Britain and Germany, and in the newer nations of Asia and Africa. The U.S., has witnessed several new developments: a dramatic increase in the number of community colleges, the expansion of the State universities, the elevation of State colleges to university status, an enormous increase in enrollments and the consequent shortage of qualified faculty personnel, a growing restlessness among the students, and the persistent problem of finance. The matter of support has been alleviated in some instances by State aid, Federal contracts for research and other services, and contributions by foundations.

University Organization in the United States. American higher education is a synthesis of the English and Continental types. The college or

university is headed by a president, and each school or college within the university is under the direction of a dean. In large institutions, instruction is handled by departments, under a chairman or head. The faculty ranks are professor, associate professor, assistant professor, and instructor. In recent years a marked trend has emerged toward interdepartmental or interdisciplinary instruction, that is, the combining of two or more related subjects of study into areas or cultural fields, for instance, American civilization or foreign-area studies.

The administration of a college or university is under the control of a board of trustees, which appoints the president. The trustees are mostly persons in business, industry, and professions other than education. They may approve major faculty and administrative appointments, but they ordinarily do not interfere in purely academic affairs. Any alleged infractions of this policy are handled by the American Association of University Professors, an organization charged with protecting the academic freedom of its members.

STUDENT LIFE. In most American colleges, the students organize clubs, fraternities and sororities, athletic teams, and a representative student council. Colleges and universities supply many types of counseling and advisory services, such as health and vocational services. Students may live in dormitories, private boarding houses, fraternity and sorority houses, or at home, according to the college regulations. They often earn all or part of their college expenses by working part time and in the summers. In foreign universities, a student seldom does any work outside of his studies, inasmuch as such activity is usually regarded as beneath his dignity. In recent years, American students have been getting an increasing number of opportunities for scholarships and fellowships.

INSTRUCTION. Instruction is carried on in classrooms, laboratories, gymnasiums, libraries, and in the field. The instructors lecture, conduct discussions and seminars, present demonstrations, and prepare examinations. Increasing use has been made recently of radio and television in college teaching. Some professors oppose these media as denying personal contacts between teacher and student. The national television networks have organized credit courses conducted by authorities in science, mathematics, and other fields who lecture to large numbers of college students.

DEGREES. Students who pass the regular four-year program of courses receive a bachelor's degree in arts, science, commerce, engineering, educa-

tion, or any of several other fields. Bachelor's degrees in law and theology are granted to those possessing a bachelor's degree from a four-year college. Graduates may continue for at least one more year for a master's degree. At one time, a master's thesis was required for a degree, but this has become increasingly rare.

The large university offers doctor's degrees and special certificates. Students may continue for at least two years beyond the master's level toward the degree of doctor of philosophy (Ph.D.), the doctor of science degree, or other types of doctorate. In the graduate school, the seminar gives advanced students opportunities to do research work and then to submit their findings for evaluation and criticism. The doctor's degree is conferred on the basis of courses, seminars, a dissertation, and written and oral examinations. The seminar was introduced in 1876 at the Johns Hopkins University on the model of the German university seminars. Professional education may be offered in a university, college, or a special school. Among the professional schools not associated with a university are the Brooklyn Law School, the Woman's Medical College of Pennsylvania, the Juilliard School of Music in New York City, and the Southern College of Optometry in Memphis, Tenn.

Since 1910, the junior college, which offers work for two years beyond the high school, has grown rapidly all over the country. Recently, the term community college has become popular to signify a junior college serving young people in a specific locality. The degree of Associate in Arts (A.A.) or Associate in Science (A.S.) is granted after completion of the two-year course, after which a graduate may continue his studies at a college or university.

Problems of Higher Education. Higher education in America faces many problems today: how to meet with adequate resources the growing numbers of students; how to manage financial affairs without raising the tuition rates so as to make college study impossible for those with limited means; how to obtain the funds with which to raise faculty salaries, provide supplementary benefits and prevent loss of the best professors to other colleges; how to give a real meaning to the process of accreditation; how to administer an athletic program without overemphasis and without neglecting study; how to achieve academic freedom without repression or anarchy; how to maintain quality of instruction despite the increasing number of students; and how to realize the ideal of equal opportunity for all without discrimination on racial, reli-

UNIVERSITY CITY

gious, or on any grounds other than academic.

See also sections on *Education* in the separate articles on individual countries and States of the U.S.

W.W.B.

UNIVERSITY CITY, city of Missouri, in Saint Louis Co., adjoining St. Louis on the w. and 6 miles n.w. of the city center. The campus of Washington University (1853) adjoins University City, and the extensive Forest Park is nearby to the w. The city was incorporated in 1906. Pop. (1960) 51,249; (1970) 46,309.

UNIVERSITY COLLEGE. See OXFORD, UNIVERSITY OF.

UNIVERSITY HEIGHTS, city of Ohio, in Cuyahoga Co., a suburb about 9 miles E. of central Cleveland. Primarily residential, the city has some manufacturing. It is the site of John Carroll University, founded in 1886. Originally known as Idlewood, the city received its present name in 1925. Pop. (1960) 16,641; (1970) 17,055.

UNIVERSITY PARK, city of Texas, in Dallas Co., on Turtle Creek, 5 miles N. of the center of Dallas, by which it is surrounded. It is the site of Southern Methodist University (1911). Settled in 1914, the city was incorporated in 1924. Pop. (1960) 23,202; (1970) 23,498.

UNKNOWN SOLDIER, unidentified remains of a soldier killed in action, ceremonially entombed as the representative of all the war dead of his country, and accorded national honors. After World War I many nations selected an unknown soldier as a means of paying tribute to those who had made the supreme sacrifice. In the United States the unknown soldier was interred in Arlington National Cemetery, Arlington, Va., on Nov. 11, 1921. His tomb, a simple white-marble structure which was dedicated on Nov. 11, 1932, rests on a terrace in front of Arlington Memorial Amphitheater. Engraved on the tomb is the inscription: "Here rests in honored glory an American soldier known but to God". On Memorial Day, 1958, two more unknown soldiers, one from World War II and one from the Korean War, were buried at the head of the Tomb of the Unknown Soldier. An unknown soldier of the Pacific campaign in World War II was buried at sea with full military honors.

The unknown soldier of Great Britain is buried in Westminster Abbey; the unknown soldier of France lies under the Arc de Triomphe, in Paris; the Belgian unknown soldier is in a tomb at the base of the Colonnade of the Congress in Brussels; and the Italian unknown soldier is buried in Rome, in front of the monument to Italian king Victor Emmanuel II (see *under* VICTOR EMMA-NUEL). Special ceremonies are held on Armi-

stice Day (now known as Veterans Day in the U.S.) to honor the unknown soldiers. Tribute is paid to the American unknown soldiers also on Memorial Day.

UNRUH, Fritz von (1885–1970), German writer, born in Koblenz. His first play was the successful *Offiziere* ("Officers", 1911). Unruh served as a captain in World War I; his war diary, *Opfergang* (1916; Eng. trans., *The Way of Sacrifice*, 1928), describes the Battle of Verdun (q.v.) and the pacifist feelings he had developed. He became a leading proponent of expressionism as a literary style; see EXPRESSIONISM: *Literature and Film*; GERMAN LITERATURE: *Expressionism*. When the German dictator Adolf Hitler (q.v.) came to power in Germany in 1933, Unruh went to France; during World War II he escaped from a French concentration camp and came to the United States.

Among his many plays are *Ein Geschlecht* ("A Family", 1916), *Platz* ("Place", 1920), *Zeno* (1931), and *Friede in U.S.A.* ("Peace in the U.S.A.", 1968). He also wrote poetry and other works. *The End Is Not Yet* (1947), often considered his best work, is a condemnation of totalitarian ideology in all its forms.

UNTERMAYER, Louis (1885–1977), American poet and anthologist, born in New York City. After working twenty-one years as a jewelry manufacturer, he began to devote himself to literature in 1923. Although best known as an anthologist, he is also highly regarded as a romantic poet (see ROMANTICISM) and as a parodist. Untermeyer lectured at many American universities and served as consultant in poetry in the Library of Congress, 1961–63. Among his numerous books are the anthologies *Modern American Poetry*; *Modern British Poetry* (1962); *The World's Great Stories* (1964); and *Fifty Modern American and British Poets* (1973); the collections of his own poetry *Burning Bush* (1923) and *Long Feud: Selected Poems* (1962); *Bygones: An Autobiography* (1965); and the children's books *The Pursuit of Poetry* (1969) and *Cat O'Nine Tails* (1971).

UPANISHADS, lofty, broadly speculative portions of the Vedas, the most ancient scriptures of Hinduism (q.v.); see VEDA. The Upanishads, which deal with early Hindu esoteric and mystical philosophical concepts, serve as the basis of one of the six orthodox systems of Hindu philosophy, Vedanta (q.v.). Some 150 Upanishads exist (108, according to the traditionally accepted number). They are mostly written in prose with interspersed poetic portions, although some are written entirely in verse. Their lengths vary: the shortest can fit on one printed

page, the longest would extend more than fifty pages. In their present form, they are believed by scholars to have been composed between 400 and 200 B.C.; and thus they represent a comparatively late aspect of Vedic Hinduism (some Upanishadic texts, however, are believed to have originated perhaps as early as the 6th century B.C.). The underlying concern of the Upanishads is the nature of Brahman (q.v.), the Universal Soul; and the fundamental doctrine expounded in the Upanishads is the identity of Atman, or the innermost soul of each individual, with Brahman; see BRAHMANISM. This doctrinal truth is variously formulated and repeatedly stressed throughout the Upanishadic writings. Other topics include the nature and purpose of existence, various ways of meditation and worship, eschatology (q.v.), salvation, and the theory of transmigration (q.v.) of souls. See also RELIGION: *The Ways of Liberation*.

UPDIKE, John (Hoyer) (1932–), American writer, born in Shillington, Pa., and educated at Harvard University and the Ruskin School of Drawing and of Fine Art of the University of Oxford, England. Updike was a staff writer for *The New Yorker* magazine from 1955 to 1957. *The Carpentered Hen* (1958), his first published book, was a collection of verse. His first novel, *The Poorhouse Fair* (1959), was about the inhabitants of a home for the aged and was greeted with much critical praise. *Rabbit, Run* (1960) told the compelling story of a young man in flight from disillusionment. In *The Centaur*, which was awarded the 1963 National Book Award for fiction, Updike transformed characters from Greek legend into a Pennsylvania schoolteacher and his adolescent son. *Of the Farm* (1965) was a short intense look at a man torn between past and present, as represented by his mother and his wife. *Couples* (1968) probed the world of suburban married couples in the mid-1960's. *Bech: A Book* (1970) is a collection of seven interrelated stories. *Rabbit Redux*, a novel dealing with the main character of *Rabbit, Run*, grown older, conservative, and trying to cope with contemporary problems, was published in 1971.

UPJOHN, Richard (1802–78), Anglo-American architect, born in Shaftesbury, England. He came to the United States at the age of twenty-seven. His early church designs, beginning with his design for Saint John's Church, Bangor, Maine, completed in 1837, marked the beginning of the Gothic revival in America; see GOTHIC ARCHITECTURE. Upjohn's fame was established by his design for Trinity Church in New York City, which was completed in 1846. Among

other buildings he designed between 1840 and 1855 are Saint Paul's Church, Brookline, Mass.; Saint James' Church, New London, Conn.; and the Corn Exchange Bank, New York City. In 1857 Upjohn was a founder of the American Institute of Architects (q.v.), and its president until 1876. **UPLAND**, city of California, in San Bernardino Co., about 20 miles w. of San Bernardino. Located in an area rich in citrus fruit, the city has fruit- and meat-packing plants. Metal products are manufactured. Upland was incorporated in 1906. Pop. (1960) 15,918; (1970) 32,551.

UPOLU. See WESTERN SAMOA.

UPPER ARLINGTON, city of Ohio, in Franklin Co., on the Scioto R., adjoining Columbus on the w., 5 miles N.W. of the city center. The Griggs Dam and Reservoir on the Scioto are located here. Upper Arlington was incorporated in 1918. Pop. (1960) 28,486; (1970) 38,630.

UPPER DARBY, township of Pennsylvania, in Delaware Co., 5 miles S.W. of Philadelphia, of which it is a residential suburb. It is an important suburban shopping center and has plants manufacturing plastics, electronic switches, textiles, kitchen cabinets, paper boxes, rubber products, airplane parts, and furniture. The township was incorporated in 1907. Pop. (1960) 93,158; (1970) 95,910.

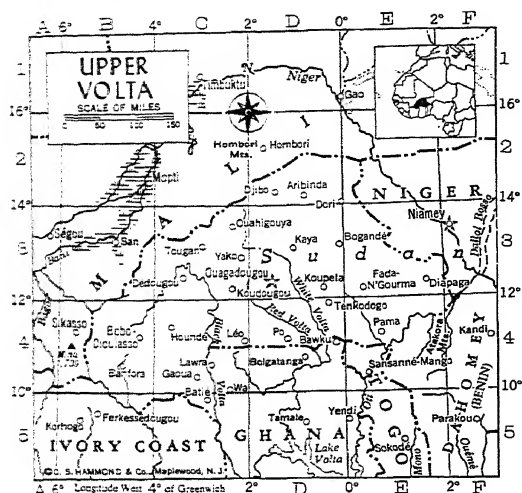
UPPER MORELAND, township of Pennsylvania, in Montgomery Co., on Pennypack Creek, 13 miles N. of downtown Philadelphia, on the Bucks Co. line. Included are Fulmore, Morganville, Terwood, Woodmont, which produces adhesives, and Willow Grove, a manufacturing center, which produces machine and metal products, electric and electronic equipment, rubber and plastic products, printed matter, industrial machinery, carpets, and yarn. Pop. (1960) 21,032; (1970) 24,866.

UPPER VOLTA, REPUBLIC OF, country in W. Africa, bounded on the N. and W. by Mali, on the E. by Niger, and on the S. by Dahomey (Benin), Togo, Ghana, and the Ivory Coast. The country is situated between about long. 2°30' E. and long. 5°25' W., and lat. 9°30' N. and lat. 15° N. The area is 105,877 sq.mi.

THE LAND

Landlocked Upper Volta is located on a plateau sloping, generally to the S., from about 650 to 2352 ft. in elevation. The plateau is drained to the S. by the Comoé, the Oti, and the Black, Red, and White Volta rivers, and to the E. by small rivers connecting with the Niger; none of the rivers is navigable. Most of the country is covered with grass and small trees. Animals include elephants, hippopotamuses, buffalo, antelopes, and crocodiles.

UPPER VOLTA, REPUBLIC OF



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Climate. A dry, cool season extends from November to March; a hot, dry one from March to May; and a hot, wet one from May to November. Rainfall decreases from more than 40 in. in the s. to less than 10 in. in the n.; the rainfall is heaviest in the summer. Temperatures vary from 70° to 80° F.

Natural Resources and Waterpower. Although not fully surveyed, Upper Volta is known to have deposits of bauxite, manganese, copper, iron, gold, cassiterite, graphite, chromium, and nickel. Water supply is already a problem in the country, and studies are under way for the construction of hydroelectric plants at Dédougou, on the Black Volta, and on the Comoé.

THE PEOPLE

The population of Upper Volta is rural. The Mossi are the largest ethnic group. Other groups include the Bobo, Sénoufo, Lobi, and Gourounsi.

A majority of the people of the Upper Volta Republic are animists. About 20 percent are Muslims, and 5 percent are Roman Catholics. French is the official language. Many tribal dia-

lects of the Sudanic language family are also spoken.

Population. The population of Upper Volta (census 1961) was 4,300,000; the United Nations estimated (1971) 5,491,000. The overall population density is 52 per sq. mi. (1970 U.N. est.).

Political Divisions and Principal Cities. Upper Volta is divided into 5 departments, subdivided into 44 districts, called "cercles". Ouagadougou, the capital, has 124,779 (1970 est.) inhabitants. Other towns are Bobo-Dioulasso, the main economic center (102,059), and Koudougou (41,200).

Education. Education is free but not compulsory. About 10 percent of the school-age population is in school. The literacy rate is about 8 percent.

ELEMENTARY AND SECONDARY SCHOOLS. In the late 1960's, about 100,000 pupils were attending about 600 primary schools, and some 8000 pupils were enrolled in about 30 secondary schools. Ten technical schools had some 1300 students, and teacher-training institutes had about 1100 students.

UNIVERSITIES AND COLLEGES. Government grants are available for higher education in France and Senegal. A number of Upper Voltans study at Dakar, Senegal, at Abidjan, Ivory Coast, and in other universities abroad.

THE ECONOMY

The basis of the Voltaic economy is agriculture, primarily for subsistence consumption. Economic assistance, chiefly from the European Economic Community, France, and the Federal Republic of Germany, has subsidized the economy since independence. Recent annual budget figures set revenue at about \$41,000,000 and expenditures at about \$37,000,000.

Agriculture. Aridity and erosion have seriously hampered agriculture, and farming methods used are primitive. Annual production of leading crops in the early 1970's averaged 798,000 tons of sorghum and millet, 68,000 tons of peanuts, 42,000 tons of corn, 37,000 tons of rice, and 15,000 tons of cotton. The principal wealth of Upper Volta is its livestock: 2,900,000 cattle, 2,000,000 sheep, 141,000 pigs, and 260,000 horses and asses.

Mining and Manufacturing. Mineral resources are barely prospected or exploited. Some potential is apparent, especially for manganese and diamonds, but this has not yet been developed. Gold production in the late 1960's totaled about 35,000 troy oz. annually. Still in its infancy, manufacturing is principally related to processing agricultural products, particularly cotton, oils and fats, and sisal twine.

Currency and Banking. The currency is the C.F.A. franc, issued by the Central Bank of West Africa (206.8 C.F.A. francs equal U.S.\$1; 1975). The banking system includes the National Economic and Social Development Bank, the Central Bank of West Africa, and two French banks.

Commerce and Trade. Livestock accounts for 60 percent of exports, and cotton, peanuts, and hides and skins compose the remainder. Imports consist of food, beverages, tobacco, petroleum, textiles, clothing, iron, steel, metal products, vehicles, electrical equipment, and machinery. In the early 1970's imports were valued at some \$55,000,000 annually, and exports totaled about \$17,000,000.

Transportation and Communications. A railroad links Ouagadougou to Abidjan, Ivory Coast. The country has about 10,500 mi. of roads, of which some 3800 mi. are improved; Ouagadougou and Bobo-Dioulasso are served regularly by French airlines. A government-owned television service provides daily transmissions at 150 collective viewing centers, and radio broadcasts are made in French and thirteen vernacular languages. Upper Volta also has 2 daily newspapers and 2 weeklies.

Labor. The total labor force numbers about 3,000,000, with more than 90 percent engaged in subsistence agriculture. The approximately 25,000 wage earners include 15,000 public employees. Unemployment is widespread.

GOVERNMENT

Upper Volta was established as an independent republic under a constitution in November, 1960. In January, 1966, the army seized control of the government, ruling by military decree for four years. A new constitution, adopted in June, 1970, was suspended in February, 1974.

Central Government. According to the 1970 constitution, executive power is vested in the president. The years 1970 to 1974 were designated as a transitional period, however, and the president was the highest-ranking military officer, General Sangoulé Lamizana (1916–). He retained control in 1974 and served simultaneously as premier and minister of justice.

Health and Welfare. The government provides hospitals and rural medical services and special medical service for schools. An old-age and veterans' pension system were established in 1960, as were workers' insurance plans in 1967.

Legislature. The 1970 constitution provided for a unicameral legislature, the National Assembly, elected by popular vote for a five-year term. The assembly was dissolved in 1974.

Judiciary. The judicial system consists of a supreme court with 4 chambers (constitutional,

judicial, administrative, and fiscal), a court of appeals, and 2 courts of first instance.

Defense. Upper Volta is a member of the Common Defense Pact of the Afro-Mauritian Common Organization (OCAM). Military service is compulsory for eighteen months. The armed forces number about 1800, and police and security forces about 1200.

HISTORY

The history of Upper Volta is largely the history of the ancient Mossi kingdom. Various Mossi states were built up about the 14th century by peoples migrating from the north of modern Ghana. They evolved a strong administrative system and a tradition of divine kingship, which enabled them to prevent their incorporation by any of the Sudanic empires. The kingdom of Songhai (q.v.), however, succeeded in conquering the Mossi.

By the 19th century the Mossi states were greatly weakened. In 1896 the French established a protectorate over the kingdom of Ouagadougou, and in 1904 the area became part of the colony of Haut-Senegal-Niger. In 1919 it was made into a separate constituent territory of French West Africa, only to be divided up in 1932 between the French Sudan and the Ivory Coast. Upper Volta was reconstituted a separate territory in 1947.

Following the reforms of the French Union in 1957, Upper Volta became, in 1958, a self-governing republic and a member of the new French Community. A government was formed, headed by Maurice Yaméogo (1921–), leader of the political party known as the Union Démocratique Voltaïque (U.D.V.). In 1959, Upper Volta joined the council of the Entente, a loose association based on mutual political and economic interests. The Entente was composed of the Ivory Coast, Niger, Dahomey, and Togo. The independence of Upper Volta was proclaimed Aug. 5, 1960.

After independence Upper Volta maintained close ties with France and with the Ivory Coast, where large numbers of Upper Voltans have migrated to work. Upper Volta remained an associated state of the European Economic Community.

Yaméogo, who was elected president in 1960, was reelected in November, 1965; he was the sole candidate. Following the adoption by the national assembly of austerity measures in December, 1965, a crisis erupted between the government and the labor unions. At the call of the latter, Lamizana, then army chief of staff, assumed power on Jan. 3, 1966, and suspended the constitution. Shortly thereafter, the new

UPPSALA

government embarked on an austerity program of its own, which eventually succeeded in arresting the deterioration of the economy. Under the constitution of 1970, Lamizana became president for four years.

In the early 1970's the effects of a five-year drought threatened famine in Upper Volta and five other West African countries. In September, 1973, at an international conference in Ouagadougou, the six countries proposed a \$1,500,000,000 aid plan. The continued drought and economic dislocation, however, brought a second dissolution of the government. Lamizana remained as president and premier. In May, 1974, he established a single-party state.

UPPSALA, city in Sweden, and capital of Uppsala County, about 50 miles N.W. of Stockholm. It is important because it is the seat of the primate, the only archbishop of the Swedish church, and the site of the principal university in Sweden, the University of Uppsala. The cathedral, built of brick in the Gothic style, was founded in 1289, completed in 1435, partly burned down in 1702, and only partly restored since that disaster. The university, founded in 1477, has the largest library in Sweden. About 3 mi. to the N.E. lies Old Uppsala. Pop. (1971 est.) 130,097.

UPPSALA, UNIVERSITY OF, coeducational autonomous institution of higher learning, located in Uppsala, Sweden. It is supervised by the office of the chancellor of Swedish universities, which is in turn responsible to the ministry of education. Financial support is provided by the national government. The university, oldest in Sweden, was founded by Archbishop Jakob Ulfsson (1468-1514) and the regent of Sweden

Sten Sture the Elder (1440?-1503) in 1477. The university was sanctioned the same year by Pope Sixtus IV (see *under* SIXTUS). It was closed in 1580 because of political and religious disputes of the Reformation (q.v.), but was reopened in 1593. The university comprises faculties of theology, law, medicine, arts, social science, science, and pharmacy. The *kandidat* degree is awarded after a two- to four-year course of study and generally represents the equivalent of an American baccalaureate degree. The *licentiat* degree, which is at least the equivalent of an American degree of master, is awarded after two to four years of additional study. The *doktor* degree is awarded after the *licentiat*, upon completion of a thesis. The library contains more than 1,300,000 bound volumes. In 1972-73 students numbered about 21,300 and the faculty, about 600.

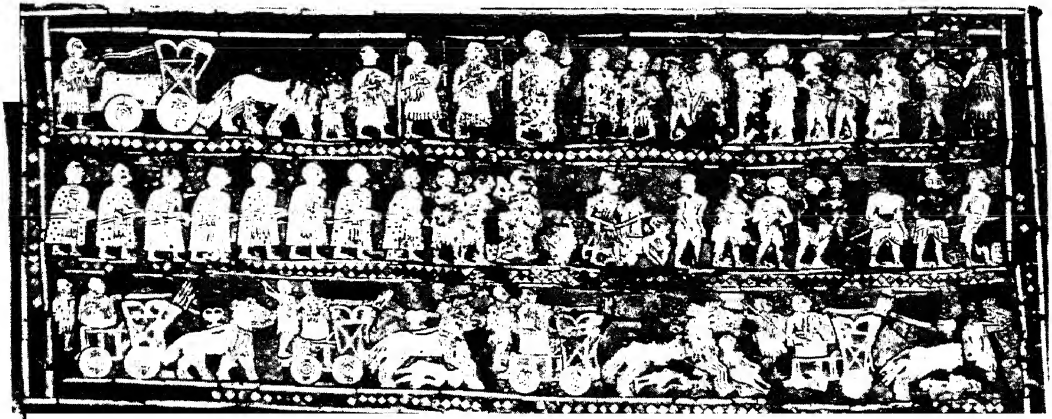
UR (Biblical, *Ur of the Chaldees*), city of Mesopotamia, in ancient Sumer midway between Baghdad (q.v.) and the head of the Persian Gulf and about 10 miles W. of the Euphrates R., on the edge of the Al Hajara desert. The site of Ur is known today as Tell al-Mugayyar, Iraq. In antiquity the Euphrates River (q.v.) flowed near the city walls. Controlling this outlet to the sea, Ur was favorably located for the development of commerce and for attaining political dominance.

Ur was the principal center of worship of the Sumerian moon god Nanna and of his Babylonian equivalent Sin. The massive ziggurat of this deity, one of the best preserved in Iraq, stands about 70 ft. above the desert. See BABYLONIAN ART; SUMERIAN RELIGION.

The Biblical name refers to the Chaldeans, who settled in the area about 1000 B.C.; see BABYLONIA. The Book of Genesis (11:27-32) describes Ur as the starting point of the migration west-

Four-wheeled war chariots are depicted on the mosaic Standard of Ur, one of the great archeological finds, dating from 2500 B.C.

British Museum



ISOMETRIC PROJECTION

ward to Palestine of the family of Abraham (q.v.) about 1900 B.C.

History. Ur was one of the first village settlements founded by the so-called Ubaidian inhabitants of Sumer (q.v.) about 4000 B.C. Before 2800 B.C. Ur became one of the most prosperous Sumerian city-states. According to ancient records, Ur had three dynasties of rulers who, at various times, extended their control over all of Sumer. The founder of the First Dynasty of Ur was the conqueror and temple builder Mesanepadda (fl. about 2500 B.C.), the earliest Mesopotamian ruler described in extant contemporary documents. His son Aannepadda built the temple of the goddess Ninhursag, which was excavated in modern times at Tell el-Obeid, about 4 miles N. of Ur. Of the Second Dynasty of Ur little is known.

Ur-Nammu (2053–1944 B.C.), the first king of the Third Dynasty of Ur who revived the empire of Sumer and Akkad, won control of the outlet to the sea about 2050 B.C. and made Ur the wealthiest city in Mesopotamia. His reign marked the beginning of the so-called renaissance of Sumerian art and literature at Ur; see SUMERIAN ART AND ARCHITECTURE; SUMERIAN LANGUAGE AND LITERATURE. Ur-Nammu and his son and successor Shulgi (about 2030–1995 B.C.) built the ziggurat of Nanna and magnificent temples at Ur and in other Mesopotamian cities. The descendants of Ur-Nammu continued in power for more than a century or until about 1950 B.C., when the Elamites captured Ibbi-Sin, King of Ur, and destroyed the city; see ELAM.

Rebuilt shortly thereafter, Ur became part of the Kingdom of Isin, later of the Kingdom of

Reconstruction of the ziggurat of Nanna, built by King Ur-Nammu.

British Museum

Larsa, and finally was incorporated into Babylonia. During the period when Babylonia was ruled by the Kassites (q.v.), Ur remained an important religious center. It was a provincial capital with hereditary governors during the period of Assyrian rule in Babylonia.

After the Chaldean dynasty was established in Babylonia, King Nebuchadnezzar II (see under NEBUCHADNEZZAR) initiated a new period of building activity at Ur. The last Babylonian king, Nabonidus (r. 556–539 B.C.), who appointed his eldest daughter high priestess at Ur, embellished the temples and entirely remodeled the ancient ziggurat of the moon god Nanna, making it a rival even of the temple of Marduk at Babylon (q.v.). After Babylonia came under the control of Persia, Ur began to decline. The city disappeared from history in the 3rd century B.C., probably as a result of a shift in the course of the Euphrates R.

In 1854–55 A.D. the ruins of Ur were found and first excavated by the British consul J. E. Taylor, who partly uncovered the ziggurat of Nanna. The British Museum commenced, in 1918–19, excavations there and at neighboring Tell el-Obeid under the direction of the British archaeologists Reginald Campbell Thompson (1876–1941) and Harry Reginald Holland Hall (1873–1930). These excavations were continued from 1922 to 1934 by a joint expedition of the British Museum and the University Museum of the University of Pennsylvania under the direction of the British archaeologist Sir Charles Leonard Woolley (1880–1960).

URAL

In addition to excavating the ziggurat completely, the expedition unearthed the entire temple area at Ur and parts of the residential and commercial quarters of the city. The most spectacular discovery was that of the Sumerian royal cemetery, dating from before 2500 B.C. and containing art treasures of gold, silver, bronze, and precious stones. The findings left little doubt that the death of the king and queen of Ur was followed by the voluntary death of their courtiers and personal attendants, and of the court soldiers and musicians. Within the city itself were discovered thousands of cuneiform (q.v.) tablets comprising administrative and literary documents ranging in date from about 2700 to about 300 B.C. The deepest levels of the city contained traces of a flood, alleged to be the Deluge (q.v.) of Sumerian, Babylonian, and Hebrew legend. All scientific evidence, however, indicates that it was merely a local flood.

E.I.G. & S.N.K.

URAL, river of the Soviet Union, in the Russian S.F.S.R. and the Kazakh S.S.R., rising in the S. Ural Mts. (q.v.), and flowing S. past Magnitogorsk, Orenburg (Chkalov), and Ural'sk into the Caspian Sea. It is the traditional boundary between Europe and Asia. It is about 1575 mi. long.

URAL-ALTAIC LANGUAGES, group of languages spoken over a vast territory extending from Okhotsk in the U.S.S.R. to Finland, Hungary, and Turkey, and from the Mediterranean Sea to the Arctic Ocean. The Ural-Altaic languages have long been regarded as a single language family consisting of two main subgroups: the Uralic and the Altaic (qq.v.) language families. According to many modern linguistic scholars, however, exhaustive comparative studies of the two language groups have revealed no indisputable, genetic link between them, particularly with regard to sound correspondences and vocabulary resemblances. On the other hand, both the Uralic and Altaic languages share important grammatical features, for example, vowel harmony, suffixation of a strongly agglutinative type (see **PHILOLOGY**), and absence of grammatical gender. If Ural-Altaic unity is accepted, the number of speakers is well above 100,000,000, with more than 75,000,000 for Altaic and 28,000,000 for Uralic.

M.P.

URALIC, family of languages spoken by numerous peoples in a vast area of northern Eurasia. It usually is divided into two subgroups, between which there exists a demonstrable genetic relationship; the Finno-Ugric languages (q.v.), and the Samoyedic or Samoyed languages (see **SAMOYEDS**). Some linguistic scholars, however, prefer a division into three subgroups: Fin-

nic, which includes Finnish, Estonian, Karelian, Livonian, Veps, Cheremis, Mordvin, Votvak, Zyrian, and the Lapp languages, spoken by less than 10,000,000 people; Ugric, which includes Hungarian, Ostyak, and Vogul, spoken by about 18,000,000 people; and Samoyedic or Samoyed, spoken by about 30,000 people in northwestern Siberia.

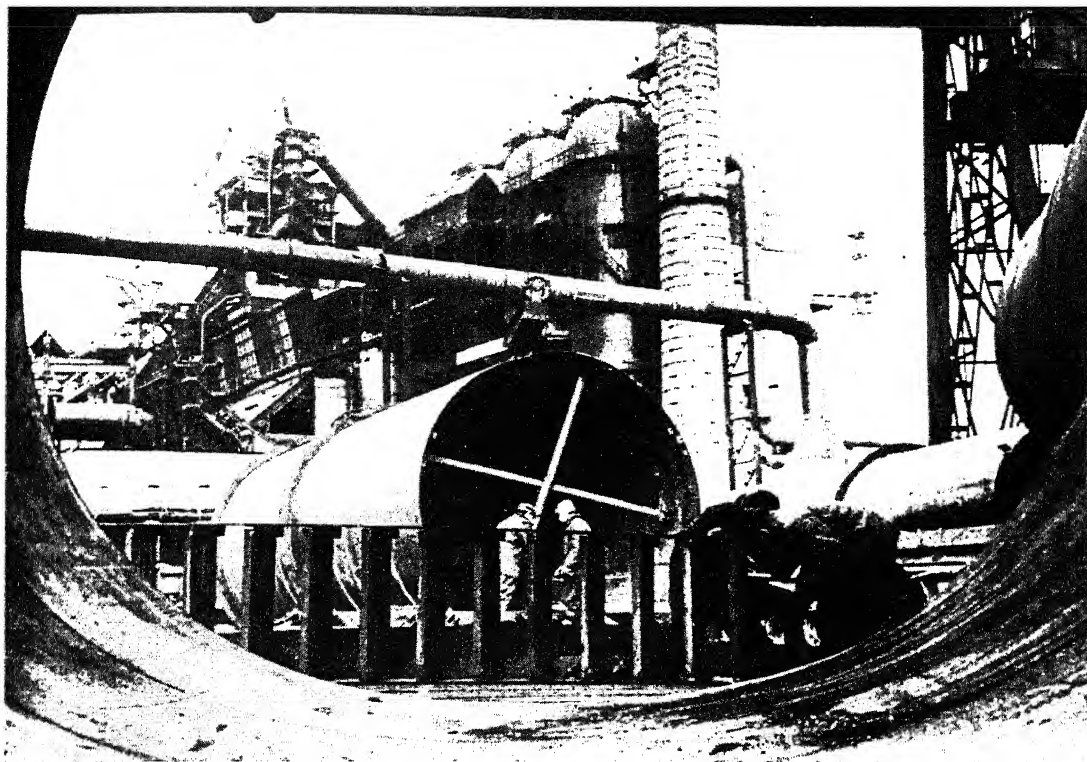
Altaic (q.v.), another important north Eurasian family of languages, has often been linked with Uralic to form one, larger family, the so-called Ural-Altaic languages (q.v.). Many modern linguistic experts, however, unable to show an indisputable, genetic link between the two, regard Uralic and Altaic as separate families.

M.P.

URAL MOUNTAINS, mountain chain of the Soviet Union, extending approximately 1500 mi. from its N. boundary at the Arctic Ocean to its S. limits at the Caspian Sea, and separating the continents of Europe and Asia. The chain is divided roughly into three main divisions, the Northern, Middle, and Southern Urals. The Northern Urals, extending from Bayderata Bay S.W. to the 64th parallel of latitude, constitute a distinct craggy, stony, narrow range with crests averaging 1000 to 1500 feet in height. This range contains the highest Ural crest, Narodnaya, which is 6184 ft. high. Other Northern peaks include Sablya, Teplos-Iz, and Isherim. Except for sparse growths of larch, the area is devoid of trees.

Numerous plateaus, characterized by broad, flat, marshy valleys, extend in a S.W. direction from the S. limits of the Northern Urals. The entire Middle Ural region is covered with dense coniferous forests, and extends to a latitude of 61° N. From lat. 61 N. to lat. 60 N., a succession of N.E. mountain chains marks the N. boundary of the Middle Urals. The S. boundary is marked by numerous hills of 1000 to 2000 ft. separated by deep ravines. The Konzhakovski Kamen, 5154 ft. high, is the highest peak of the N. and S. portions of the Middle Urals, respectively. Dense forests, rich soils, and fertile valleys cover the entire area.

South of the Middle Urals, from lat. 55 N. to lat. 51 N. are three parallel mountain chains which constitute the Southern Urals. The first of these, the Urals proper, is a low chain ranging in height from 2200 to 2800 ft. To the W., a higher range, containing many rivers, reaches a height of 5230 ft. and is paralleled farther W. by an equally high range. All three ranges are heavily wooded with deciduous plant life and contain rich pasture lands. The Urals continue from lat. 51° N. toward the Volga R. and, under the name



Installation of pipes during the construction of a mammoth blast furnace in a metallurgical plant shows the continued industrialization of the Urals by the Soviet government.

UPI

of Obshchiy Syrt, comprise a system of plateaus reaching 1500 ft. in height and 200 mi. in width. South of the Ural R., the Ural chain appears as a group of independent ranges.

Geologically, the Ural Mts. constitute a mass of folds covered mostly by the Tertiary deposits of w. Siberia. The N.-W. and N.-E. ranges were created by the numerous series of distinct upheavals during early geologic times. Most of the chain contains broad layers of such minerals as granite, diorite, peridotite, and various gneisses, which are covered over in the western portions with Middle and Upper Paleozoic strata; see PALEOZOIC ERA.

One of the most important industrial areas of the Soviet Union is located in the Middle and Southern Urals. Intensive industrialization of the region began during World War II (q.v.), when the government established many industries there in order to create armaments-production centers far from the military zone. After the war industrial development increased.

The Ural region has extensive deposits of iron ore and coal in close proximity as well as rich deposits of chromium, manganese, copper, zinc, bauxite, platinum, silver, and gold. Just to the E. is the major oil-producing area called the Second Baku. Among the important industrial cities are Magnitogorsk, Sverdlovsk, Chelyabinsk, Perm', and Nizhniy Tagil.

URANIA. See APHRODITE; MUSES.

URANINITE. See PITCHBLEND.

URANIUM, radioactive element with at.no. 92, at.wt. 238.03, b.p. about 3818° C. (6872° F.), m.p. 1132° C. (2069.6° F.), sp.gr. 19.04 at 25° C., and symbol U. It belongs to the actinide series, which includes the radioactive elements through element 103; see PERIODIC LAW.

Uranium never occurs naturally in the free state but is found as an oxide or complex salt in minerals such as pitchblende (q.v.) and carnotite. Pure uranium consists of more than 99 percent of the isotope uranium-238, less than 1 percent of the fissile isotope uranium-235, and a trace of uranium-234, formed by radioactive decay of uranium-238. Artificially produced isotopes of uranium include uranium-233, uranium-237, and uranium-239.

Uranium was discovered in 1789 in the mineral pitchblende by the German chemist Martin Heinrich Klaproth (1743-1817), who named it after the planet Uranus. The element, first isolated in the metallic state in 1842, has an average concentration in the crust of the earth of about 4 parts per 1,000,000. The radioactive properties of uranium were first demonstrated in 1896 when the French physicist Antoine Henri Bec-



Uranium ore is stockpiled before being processed in a plant in Colorado. U.S. Vanadium Co.

querel (see BECQUEREL) produced, by the action of the fluorescent salt potassium uranyl sulfate, an image on a photographic plate covered with a light-absorbing substance. The investigations of radioactivity that followed Becquerel's experiment led to the discovery of radium (q.v.) and to new concepts of atomic disintegration; see ATOM AND ATOMIC THEORY; NUCLEAR ENERGY; RADIOACTIVITY.

Extraction. In the classical procedure for extracting uranium, pitchblende is broken up and mixed with sulfuric and nitric acids. Uranium dissolves to form uranyl sulfate, UO_2SO_4 ; radium and other metals in the pitchblende ore are precipitated as sulfates. With the addition of sodium hydroxide, uranium is precipitated as sodium diuranate, $\text{Na}_2\text{U}_2\text{O}_7 \cdot 6\text{H}_2\text{O}$, known also as the yellow oxide of uranium. To obtain uranium from carnotite, the ore is finely ground and treated with a hot solution of caustic soda and potash to dissolve out uranium, radium, and vanadium. After the worthless sandy matrix is washed away, the solution is treated with sulfuric acid and barium chloride. A caustic alkali solution added to the remaining clear liquid precipitates the uranium and radium in concentrated form.

These classical methods of extracting uranium from its ores have been replaced in current practice by such procedures as solvent extraction, ion exchange (q.v.), and volatility methods. For the method of producing the artificial isotope uranium-233, see THORIUM.

Uranium ores are widely distributed through-

out the world. Deposits of pitchblende, the richest uranium ore, are found chiefly in Czechoslovakia, Canada, the Congo, and the United States. Most of the uranium mined in the U.S. is obtained from carnotite occurring in Colorado, Utah, New Mexico, Arizona, and Wyoming. A mineral called coffinite, discovered in 1955 in Colorado, is a high-grade ore containing nearly 61 percent uranium. Coffinite deposits were found subsequently in Wyoming and Arizona and in several foreign countries. In the late 1960's, annual U.S. production of uranium was about 9500 tons. During the same period world production totaled about 19,700 tons annually.

Since the inception of the large-scale international search for uranium following World War II, the element has been detected with the aid of such instruments as Geiger-Müller or scintillation counters, which can easily be operated by inexperienced prospectors; see IONIZATION CHAMBER; SCINTILLATION COUNTER.

Properties. Uranium has three crystalline forms, of which the one that forms at 775°C . (1427°F .) is malleable and ductile. Uranium is soluble in hydrochloric and nitric acids and insoluble in alkalis. Uranium displaces hydrogen from mineral acids and from the salt solutions of such metals as mercury, silver, copper, tin, platinum, and gold. At elevated temperatures it burns readily in air and at 1000°C . (1832°F .) combines with nitrogen to form a yellow nitride. It has oxidation states of three, four, five, and six. The hexapositive or uranyl, compounds include uranyl trioxide, UO_3 , and uranyl chloride, UO_2Cl_2 . Uranium tetrachloride, UCl_4 , and uranium dioxide, UO_2 , are examples of the tetrapositive or uranous, compounds. Uranous compounds are usually unstable; they revert to the hexapositive form when excessively exposed to air. Uranyl salts, such as uranyl chloride, may decompose in the presence of strong light and organic matter.

Uses. After the discovery of nuclear fission, uranium became a strategic metal, and its uses were at first restricted mainly to the production of nuclear weapons (q.v.). In 1954 the U.S. government relaxed controls to permit leasing of uranium enriched in the isotope uranium-235 to various private and foreign agencies for the development of nuclear power. Peacetime applications of uranium were discussed at three International Conferences on the Peaceful Uses of Atomic Energy held in Geneva, Switzerland, in 1955, 1958, and 1964. To encourage the construction of private nuclear-power plants, Congress in 1964 took steps to permit the private ownership of nuclear fuel. Legislation provided

that as of 1971 the Atomic Energy Commission (q.v.) would be prohibited from making new arrangements for leasing power-reactor fuel. Since 1973 all fuel for commercial facilities has been privately owned.

The potentiality of uranium as a vast source of industrial power became apparent with the launching in 1954 of the first nuclear-powered submarine, the U.S.S. *Nautilus*; see SUBMARINE. By 1959 several nuclear-power plants in Great Britain, the Soviet Union, and the U.S. were providing electricity for civilian use. The first such U.S. plant, which began operations at Shippingport, Pa., generates 60,000 kw and requires about 15 lb. of uranium-235 per month. Conventional plants producing 60,000 kw consume about 40,000,000 lb. of coal per month. However, problems of uranium scarcity, plant safety, and storage of radioactive uranium and plutonium (q.v.) waste products have prevented full realization of nuclear energy's potential. See NUCLEAR POWER.

G.T.S.

URANUS, major planet in the solar system, equivalent in brightness to a sixth-magnitude star and represented by the symbols ♅ and ♁. It ranks seventh in order of distance from the sun, revolving outside the orbit of Saturn and inside the orbit of Neptune; see PLANET. Uranus was accidentally discovered in 1781 by the British astronomer Sir William Herschel (see under HERSCHEL) and was originally named the *Georgium Sidus* (Star of George), or the Georgian, in honor of his royal patron George III (q.v.), King of Great Britain. The planet was later, for a time, called Herschel in honor of its discoverer. These

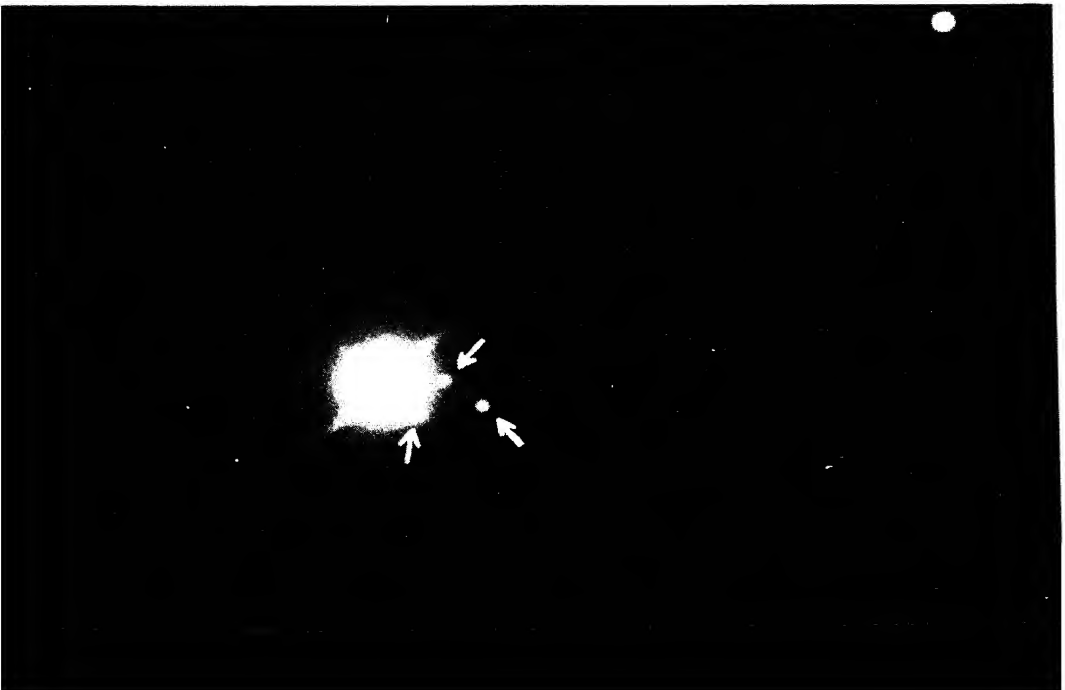
names proved to be unpopular internationally, however, and the name Uranus, first proposed by the German astronomer Johann Elert Bode (q.v.), was in use by the late 19th century.

Uranus has a diameter of 29,500 mi., and its mean distance from the sun is 1,800,000,000 mi. Uranus takes eighty-four years for a single revolution or orbit, and about 10 hr. 49 min. for a complete rotation about its axis, which is inclined 98° to the plane of the planet's orbit around the sun. Spectroscopic analysis (see SPECTRUM) reveals hydrogen and methane in its atmosphere, but no ammonia, which has possibly been "frozen out" of the -270° F. temperature surrounding the planet. Through the telescope the planet appears as a small, bluish-green disk with a faint green periphery.

The Rings of Uranus. In 1977, while recording the occultation of a star behind the planet, the American astronomer James L. Elliot (1943-) discovered the presence of five rings encircling the equator of Uranus. Named Alpha, Beta, Gamma, Delta, and Epsilon (starting from the innermost ring), they form a 4400-mi.-wide belt about 11,000 mi. above the clouds.

Satellites. In addition to its rings, Uranus has five satellites; all revolve about its equator, moving with the planet in an east-west direction. The outermost moons, Oberon and Titania, were discovered by Herschel in 1787. The next two, Umbriel and Ariel, were found in 1851 by the British astronomer William Lassell (1799-1880). The innermost moon, Miranda, was

Uranus with three of its five known satellites indicated by arrows.
Lick Observatory



URANUS

discovered in 1948 by the American astronomer Gerard Peter Kuiper (q.v.).

See PLANET; SATELLITE.

URANUS, in Greek mythology, the god of the heavens, and husband of Gaea (q.v.), the goddess of the earth. Uranus was the father of the Titans (q.v.), the Cyclopes (see CYCLOPS), and the hundred-handed giants. The Titans, led by their ruler Cronus (q.v.), dethroned and mutilated Uranus, and from the blood that fell upon the earth sprang the three Erinyes (q.v.), or Furies, who avenge crimes of patricide and perjury. Uranus may have been worshiped as a god by earlier inhabitants of Greece, but he was never an object of worship by the Greeks of the historical period.

URAWA, city in Japan, and capital of Saitama Prefecture, on the Ara R., 13 miles N.W. of Tokyo. On the Tohoku rail line, it is an educational center and the site of Saitama University. Pop. (1970) 269,000.

URBAN, name of eight popes.

Saint Urban I (d. 230), pope from 222 to 230. His pontificate was disturbed by the schism, begun in the reign of his predecessor, Saint Callistus I (r. 217–22), that was caused by the antipope Saint Hippolytus (r. 217–35), a theologian who wrote in Greek, the first antipope, and the only antipope to be canonized; see CANONIZATION. The Church was unmolested by the Roman government during Urban's reign. His traditional feast day is May 25.

Blessed Urban II (about 1040–99), original name EUDES or ODO DE CHÂTILLON, pope from 1088 to 1099, born in France. About 1073 he entered the Benedictine monastery of Cluny, of which he later became prior; see BENEDICTINES. In 1079–80 he was created cardinal bishop of Ostia (see CARDINAL) by Pope Gregory VII (see under GREGORY) and served as papal legate in what was later Germany in 1084–85. He was elected pope to succeed Gregory, becoming the first Cluniac to attain the papacy.

During the first six years of his pontificate Urban II was kept out of Rome by Antipope Clement III (r. 1080, 1084–1100), who had been selected by Henry IV (q.v.), Holy Roman Emperor. Meanwhile Urban continued Gregory VII's opposition to Henry IV on the investiture (q.v.) question. The pope also excommunicated Philip I (see under PHILIP), King of France, for adultery and generally supported Saint Anselm of Canterbury (q.v.) against William II (q.v.), King of England. In his pontificate the reform policy of Gregory VII was renewed and advanced, albeit with greater flexibility and diplomacy, and the reform of the papal chancery was

begun. In his relations with the Byzantine Empire (q.v.) Urban II sought to bring about the end of the schism between the Eastern and Western Christians, and he urged on the West the defense of Eastern Christendom against the Seljuk Turks; see CHRISTIAN CHURCH, HISTORY OF THE; SELJUKS. His preaching in 1095, of the First Crusade at the Council of Clermont (now Clermont-Ferrand, France) marked the papacy's assumption of the leadership of Western Christendom and enhanced its prestige and authority. A man of deep piety and humility, Urban was beatified in 1881; see BEATIFICATION.

Urban III (d. 1187), original name UBERTO CRIVELLI, pope from 1185 to 1187, born in Milan, Italy. Created cardinal in 1182, he became archbishop of Milan in 1185. During his pontificate Urban continued the feud between the papacy and Frederick I (q.v.), Holy Roman Emperor. During his reign of almost two years, the pope was prevented from entering Rome by Frederick's son Henry, later Emperor Henry VI (q.v.), who had invaded Italy on behalf of the Holy Roman Empire (q.v.).

Urban IV (d. 1264), original name JACQUES PANTALÉON, pope from 1261 to 1264, born in Troyes, France. Before 1245 he was archdeacon of Liège. He became archdeacon of Laon in 1249, bishop of Verdun in 1253, and patriarch of Jerusalem in 1255. Urban, one of the important medieval popes, bitterly opposed Manfred, King of Naples and Sicily (1232?–66), who prevented him from entering Rome and whose lands the pope eventually bestowed upon the count of Anjou, later Charles I (q.v.), King of the Two Sicilies. Urban also aided Henry III (q.v.), King of England, against his rebellious barons. Urban's Italian policy restored order in the Papal States (q.v.), weakened German influence, and created alliances with rulers of important cities and states. He instituted the feast of Corpus Christi (q.v.) in 1264.

Blessed Urban V (about 1310–70), original name GUILLAUME DE GRIMOARD, pope from 1362 to 1370, born in southern France. He became a Benedictine monk (see BENEDICTINES) and was to wear his monastic habit even as pope. After teaching canon law in several French universities, Guillaume became abbot of Saint-Germain in Auxerre in 1352 and of Saint-Victor in Marseille in 1361. An educator, an authority on canon law, and a papal diplomat before his election, Urban founded or aided at least nine universities. He transferred the papal court from Avignon to Rome in 1367; because of unsettled conditions in Rome, however, he returned in 1370 to Avignon, where he died.

Urban VI (about 1318–89), original name BAR-TOLEMEO PRIGNANO, pope from 1378 to 1389, born in Naples, Italy. He became archbishop of Acerenza in 1363 and of Bari in 1377. His election as pope precipitated the Western



Pope Urban VI

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Schism; see SCHISM, WESTERN. Urban's pontificate was marked by a series of quarrels induced by his headstrong and obstinate character. He deposed Joanna I, Queen of Naples (1326?–82), in 1380 for her support of Antipope Clement VII (see under CLEMENT), and excommunicated Charles III, King of Naples (see under CHARLES), her successor, in 1384. In 1387, receiving evidence that Charles and a number of cardinals were seeking to impose a regency over him, he started an abortive war against Naples. Charles had Urban under siege at Nocera (now in Italy), but the pope escaped, capturing five of the cardinals who had intrigued against him; he had them executed. Urban himself may have been murdered.

Urban VII (1521–90), original name GIAMBATTISTA CASTAGNA, pope in 1590, born in Rome. After obtaining a doctorate of laws he embarked on a career in the administration of the papal government about 1550. He was archbishop of Rossano from 1553 to 1573, governed

various papal territories between 1555 and 1578, served as papal representative at various courts between 1565 and 1586, and was created cardinal priest in 1583 and inquisitor general (see INQUISITION) of the Holy Office in 1586. He died of malaria on the twelfth day of his pontificate.

Urban VIII (1568–1644), original name MAFFEO BARBERINI, pope from 1623 to 1644, born in Florence, Italy. He obtained a doctorate of laws and began his service in the papal administration in 1589. He governed Fano after 1592, became titular archbishop of Nazareth in 1604, was created cardinal in 1606 and archbishop of Spoleto in 1608, and was papal legate to Bologna in 1617. As pope, Urban founded the Urban College in Rome in 1627 to train missionaries; authorized revision of the breviary (q.v.) in 1631; and denounced Jansenism (see JANSEN, CORNELIS) in 1642. His greatest fault was nepotism, whereby he enriched his relatives by appointing them to lucrative ecclesiastical offices. He spent vast sums on numerous construction projects, including the Palazzo Barberini in Rome and the papal villa (now the papal summer residence) at Castel Gandolfo. Urban employed the Italian artist and architect Giovanni Lorenzo Bernini (q.v.) to build the baldachin over the papal altar in Saint Peter's Basilica (q.v.). He also invested heavily in armaments, in part for his useless warfare with the duchy of Parma. In 1639 Urban prohibited the enslavement of the Indians of Brazil, Paraguay, and the West Indies. The three bees in his escutcheon may be seen on many structures in Rome.

URBANA, city in Illinois, and county seat of Champaign Co., 70 miles e. of Springfield, and adjoining the city of Champaign, with which it forms a single community. It contains extensive railroad repair shops. Industrial establishments include foundries, machine shops, food processing plants, and printing shops. The surrounding area yields agricultural products and fire clay. Urbana is the site of the University of Illinois (see ILLINOIS, UNIVERSITY OF). It was founded in 1824, incorporated as a village in 1833, and chartered as a city in 1860. Pop. (1960) 27,294; (1970) 32,800.

URBAN LEAGUE. See NATIONAL URBAN LEAGUE. **URBAN RENEWAL.** See CITY PLANNING; HOUSING; HOUSING AND URBAN DEVELOPMENT, DEPARTMENT OF.

URBINO, town of Italy, in Marche Region, in Pesaro e Urbino Province, about 19 miles s.w. of Pesaro, and 20 miles w. of the Adriatic Sea. Urbino is an agricultural center, famous for the majolica (q.v.) ware made during the Renaissance (q.v.). Among the chief points of interest

are a cathedral, rebuilt between 1789 and 1801, a 14th-century church, a 15th-century ducal palace, now a museum, and a university founded in 1506. Urbino is of Roman origin. From 1474 to 1626 it was the capital of the Duchy of Urbino and a renowned art center. The Italian Renaissance painter Raphael (q.v.) was born here. Urbino was incorporated into the Papal States (q.v.) between 1626 and 1860, when it became part of what was then the Kingdom of Italy. Pop. (1971) 13,000.

URDU. See HINDUSTANI.

UREA, or CARBAMIDE, colorless, crystalline compound, $\text{CO}(\text{NH}_2)_2$, with m.p. 132.7°C . (270.9°F). It is found abundantly in the urine of man and other mammals (see URINE AND THE URINARY SYSTEM). In lesser quantities it is present in the blood, liver, lymph, and serous fluids, and is found in the excrement of fish and many other lower animals. Urea is produced mostly in the liver as the end product of protein metabolism (q.v.). The nitrogen in urea, which constitutes most of the nitrogen in the urine, is produced mainly from food protein, but part comes from the breakdown of body cells. Urea is also present in various fungus molds and in the leaves and seeds of numerous legumes and cereals. It is soluble in water and alcohol and is slightly soluble in ether. Urea is prepared synthetically by the Wöhler synthesis, devised in 1828 by the German chemist Friedrich Wöhler (q.v.).

Because of its high nitrogen content, commercially prepared urea is used in the manufacture of agricultural fertilizers (see FERTILIZER). Urea is also employed as a stabilizer in nitrocellulose explosives, and is a basic constituent of synthetically prepared resins.

UREMIA. See KIDNEY: *Diseases of the Kidney*.

UREY, Harold Clayton (1893–), American chemist, born in Walkerton, Ind., and educated at the universities of Montana and California. From 1917 to 1919 he worked for the Barrett Chemical Company in Philadelphia, Pa. Between 1919 and 1957 he taught chemistry successively at the University of Montana, Johns Hopkins and Columbia universities, and at the universities of Chicago and Oxford. In 1958 he was named professor of chemistry at-large of the University of California at San Diego. For his discovery of deuterium (q.v.), or heavy hydrogen, and his isolation of heavy water in 1932, Urey was awarded the 1934 Nobel Prize in chemistry. Subsequently he was director of war research in the atom-bomb project at Columbia University, and also contributed to the development of the hydrogen bomb; see NUCLEAR WEAPONS. He performed important research in geo-

physics and the origin of the solar system, and in geological paleontology (q.v.). With the American physicist Arthur Edward Ruark (1899–) he wrote *Atoms, Molecules and Quanta* (2 vol., 1930), and by himself he wrote *The Planets* (1952).

URFA. See EDESSA.

URGA. See ULAN BATOR.

URI. See SWITZERLAND: *The People: Political Divisions*.

URIC ACID, white, tasteless, and odorless nitrogenous compound, $\text{C}_3\text{H}_4\text{N}_4\text{O}_3$, formed in the body as a result of protein metabolism (q.v.). It is present in small amounts in the urine of man, and in large amounts in the urine of birds and reptiles. Uric acid is only slightly soluble in water and is insoluble in alcohol and ether. When heated, the acid forms urea (q.v.), ammonia, and carbon dioxide. Gout (q.v.) is a result of a disturbance in uric-acid metabolism. Kidney stones formed by salts of uric acid occur in persons with high levels of uric acid in the urine; see KIDNEY.

URIEL. See ARCHANGEL (superhuman being).

URIM AND THUMMIM (Heb. *Ūrīm wēthummīm*, meaning unknown), according to the Old Testament (Exod. 28:30, Lev. 8:8), two objects, perhaps precious stones and presumably differing from one another in appearance, which, "put in" the "breastplate of judgment [or decision]" worn by the high priest (q.v.) of Israel, were used in divination (q.v.). From other Biblical evidence, it seems possible that one symbolized "yes", and the other, "no". In response to a question so formulated as to be answerable in the affirmative or the negative, one or the other answer would somehow be indicated, perhaps by the emergence of the appropriate object from a pouch in which both were shaken. The emergence of both might have meant that the divine decision was being withheld. The 1st-century A.D. Jewish historian Flavius Josephus (q.v.) states that divination by Urim and Thummim had ended in the 2nd century B.C.

URINE AND THE URINARY SYSTEM, liquid waste product of the body and the system of organs that produce and excrete urine. Much of the unusable material ingested by man and other animals is eliminated through the intestinal tract; in air-breathing vertebrates many of the wastes and toxins resulting from catabolic metabolism (see METABOLISM) are eliminated through the skin and lungs. Wastes that do not readily evaporate are disposed of by the urinary system. In most vertebrates the two kidneys filter all substances in the bloodstream; waste matter is produced continuously as urine, which

URINE AND THE URINARY SYSTEM

flows through the two ureters to the bladder (q.v.), a membranous sac.

After storage in the bladder, urine is released into a tube called the urethra, which leads out of the body. Urine is passed by the involuntary opening of a muscular sphincter between the bladder and the urethra and the voluntary opening of a sphincter in the urethra. Young children pass urine whenever the bladder fills. Many older children and adults have a condition known as enuresis in which the urinary sphincter cannot be controlled because of emotional disturbance. Sudden fear or fright may cause temporary enuresis. In senile persons certain types of degeneration of the nervous system can result in incontinence of the urine. Inability to pass stored urine is another common disturb-

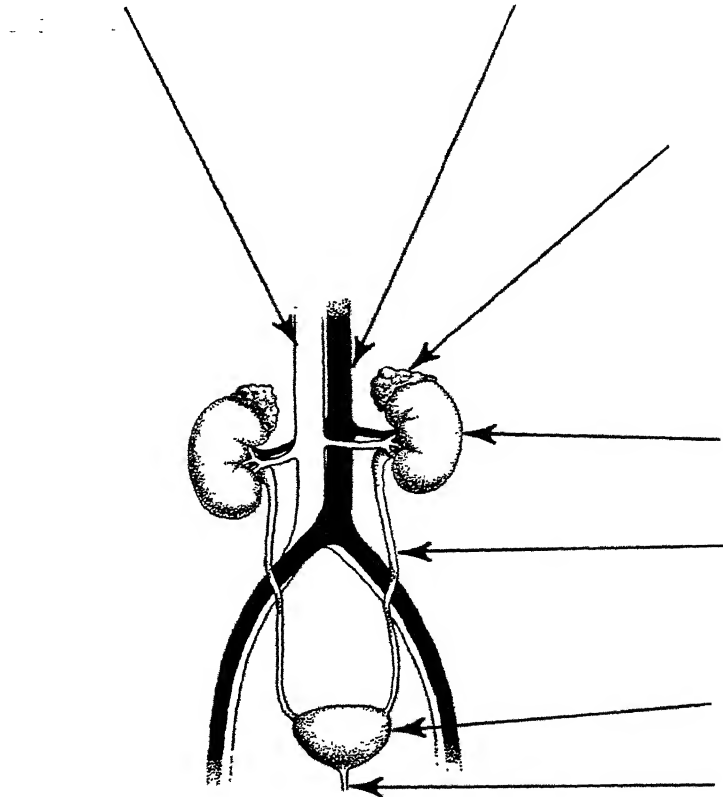
ance, caused by spasm of the urinary sphincter, blocking of the sphincter by a calculus, or stone, or a blood clot, or by loss of tonus of the bladder muscles after shock or surgical operations.

Composition of Urine. Normal urine in humans is usually a transparent, yellow liquid. The average person eliminates from 40 to 60 oz. of urine daily. Normal urine contains 96 percent water and 4 percent solids in solution. About half of the solids consist of urea (q.v.); the remainder include nitrogen, chlorides, ketosteroids, phosphate, sulfur, ammonia, creatinine and uric acid (q.v.).

Deviations from the normal composition, color, and amount of urine may occur temporarily as a result of emotional stress, rich foods, drugs, or excessive exercise.

Effects of Diseases. Persistent abnormalities,

The human urinary system



however, are indications of disease, and analysis of urine is often used in diagnosis of disease. Excessive urination is characteristic of diabetes insipidus and occurs to a lesser extent in diabetes mellitus (q.q.v.). In many febrile diseases abnormally little urination is evidenced. The color of urine is dark in patients suffering from hepatitis (q.v.), because of bile pigments in the urinary system. The quantity of urea is increased in febrile diseases and diabetes mellitus and is decreased during inflammation of the kidney or disturbance of the body's acid-base balance. Abnormally large amounts of uric acid are present in leukemia and after attacks of gout (q.v.).

Even more important than changes in the quantities of substances normally present is the appearance of abnormal substances in the urine. In kidney diseases serum albumin (see ALBUMIN) escapes into the urine, producing a condition known as albuminuria (q.v.), and in diabetes mellitus, glucose (q.v.) appears in the urine. Pus and bacteria are present during infectious diseases of the urinary system. Red blood cells are a sign of hemorrhage or cancer (q.v.) in the urinary tract. Crystals of sulfa drugs (q.v.) indicate deposition of these drugs in the kidneys. Crystals of various substances also appear when stones form in the urinary system. Occasionally a urinary calculus is passed in the urine, causing pain and sometimes hemorrhage.

Consistency of Urine. The consistency of urine varies with different species of animals. The urinary systems of reptiles and birds are designed to conserve water; the urine of these animals is a solid or semi-solid mass. Instead of producing urea, as a product of protein metabolism, they produce uric acid, which is almost insoluble in water. Most of the water is reabsorbed by the body from the urinary organs. In some fish water is conserved by the buildup of high concentrations of urea, which causes the body to absorb water by osmosis. Marine fish that cannot absorb water by osmosis must drink salt water to produce urine. Excess salt is excreted through the gills, and water is retained for urine formation.

URIS, Leon Marcus (1924–), American writer, born in Baltimore, Md. He left high school at the age of seventeen to enlist in the United States Marine Corps. His first novel, the highly successful *Battle Cry* (1953), drew upon his combat experiences in World War II; he also wrote the screenplay for the film (1954). He later published several novels of which *Exodus* (1958), a novel about the founding of Israel, achieved much critical praise and bestseller status. It was made into a motion picture (1960). A musical

version, *Ari* (1971), with libretto and lyrics by Uris, failed, however, to achieve the popularity of his action-packed fiction.

URMIA, LAKE, largest lake in Iran, situated in the n.w. corner of the country, 170 miles w. of the Caspian Sea. It is about 90 mi. long, with an average breadth of 30 mi., and occupies part of a level basin enclosed by mountains and lying at an altitude of over 4000 ft. The lake is fed by radial streams of considerable size, but it has no outlet. It is consequently very saline, too salty to nourish any life but certain crustaceans. The lake has been shrinking for years, exposing wide tracts of slime. It is very shallow; the mean depth is 6 ft., and the maximum about 40 ft.

UROCHORDA, or **TUNICATA**, group of marine animals constituting a subphylum of the phylum Chordata (q.v.), and comprising the classes Larvacea, Thaliacea, and Ascidiacea (q.v.). Of the three classes, the Ascidiacea are the most common and are found in coastal waters. The other two classes occur in the open sea. The name "Tunicata" is derived from the cuticular tunic, or outer covering, that surrounds the animals. Depending upon the species, they vary in size from microscopic forms to some that are several inches long.

URSA MAJOR. See **DIPPER, BIG.**

URSA MINOR. See **DIPPER, LITTLE.**

URSAE MINORIS. See **NORTH STAR.**

URSULA, Saint (fl. 4th cent.?), legendary Christian martyr, possibly British and specially honored in Cologne, West Germany, the place of her presumed martyrdom. The legend is recorded by the Belgian chronicler Sigebert of Gembloux (1030?–1112) and in the *Acta Sanctorum* of the Bollandists (q.v.). She was one of either 11 or 11,000 virgins—versions of the story vary considerably—who were massacred by the Huns; one account places the event in 451. In the middle of the 12th century, citizens of Cologne, digging foundations across the cemetery of the old Roman settlement of Colonia Agripinensis, found a number of bones. These were declared to be the relics of the virgins. Ursula is the patron saint of maidens. Her traditional feast day, Oct. 21, is no longer included in the Roman Catholic calendar; see **SAINT.**

URSULINES, in full, the **ORDER OF SAINT URSULA**, Roman Catholic teaching order (see **ORDERS, RELIGIOUS**) involved primarily in the education of young girls. It was founded in Italy in 1535 by Saint Angela Merici of Brescia (1474–1540), an Italian nun; the foundress was canonized in 1807. Originally the members formed a noncloistered institute, but they began to live in secluded communities in Milan in 1572 and in

Avignon in 1596. The strictly cloistered French nuns were temporarily dispersed during the French Revolution (q.v.). From Paris and Bordeaux the order spread into North America in the 17th century, and from other European centers it entered more remote parts of the world during the 19th century. In Louisiana the Ursulines founded, in New Orleans in 1727, one of the first institutions of learning for women in the territory of the United States. After the Battle of New Orleans in the War of 1812 (qq.v.) the nuns turned their school into a hospital and nursed both American and British wounded. About 1200 Ursulines were reported by the order in the U.S. in the early 1970's. They maintain elementary schools, secondary schools, and colleges, among them the College of New Rochelle, N.Y.; Ursuline College, Louisville, Ky.; and Ursuline College for Women, Cleveland, Ohio.

URTICARIA. See HIVES.

URUGUAY (Sp. *República Oriental del Uruguay*), smallest republic of South America, sit-

uated in the east-central part of the continent, and bounded on the N. by Brazil, on the E. by Brazil and the Atlantic Ocean, on the S. by the Atlantic Ocean and the Río de la Plata, and on the W. by the Uruguay R., which separates it from Argentina. Uruguay lies between about lat. $30^{\circ}4'$ S. and lat. $35^{\circ}3'$ S. and about long. $53^{\circ}10'$ W. and long. $58^{\circ}24'$ W. The area is 72,172 sq.mi.

THE LAND

The terrain in the S. consists of grassy, rolling plains, except for tidal marshland along the Atlantic coast. In the N. and N.W. is a plateau, the Cuchilla de Haedo, diversified by low ridges of hills which rise to an extreme height of 1237 ft. above sea level. The E. portion of the country is dominated by the Cuchilla Grande, which extends generally S. from Brazil to a point near Punta del Este; it rises to 1644 ft. at Mirador Nacional, the highest elevation in Uruguay. Woodland occurs chiefly along the river banks. Uruguay has 120 mi. of Atlantic coastline and 505

The city and harbor of Montevideo, capital of Uruguay.
Pan American World Airways



URUGUAY

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mi. of frontage along its boundary rivers, including 270 mi. on the Uruguay R. and 235 mi. on its estuary, the Río de la Plata. The Río Negro is the principal river of the Uruguayan interior; only its lower portion is navigable. The Uruguay R. is navigable from its mouth to Salto.

Climate. Uruguay has a temperate climate. The average temperature for the warmest months, January, and February, is 71° F. and for the coldest month, June, 50° F. Rainfall is well distributed and averages 35 in. During the winter months cold storms, known as *pamperos*, blow from the s.w., but frost is virtually unknown.

Natural Resources. The principal resources are agricultural; minerals are scarce. The soils are generally very fertile, except for the sandy, marshy soils along the E. coast. Hydroelectric power is of major importance in Uruguay. Two hydroelectric power plants are in operation on the Río Negro. The electric-power industry is under the control of the government.

Plants and Animals. The predominant vegetation in Uruguay is tall prairie grass. A small purple flower grows in such abundance that Uruguay sometimes is called the "Purple Land". Other flowering plants are the myrtle, mimosa, rosemary, and scarlet-flowered ceibo. Indigenous hardwood trees include the urunday, lapacho, carob, quebracho, jacaranda, willow, and acacia. Palms flourish in the s.e. and in the valleys of the central region and the N. In the

coastal area pine and eucalyptus trees have been planted to halt the movement of sand. The poplar, cypress, oak, cedar, mulberry, and magnolia also have been introduced.

The puma, rhea (or American ostrich), tapir, and seal, which were relatively abundant when the Spanish first visited Uruguay, are now scarce. The deer, otter, wild hog, fox, wildcat, armadillo, anteater, and various rodents are the most frequently seen mammals.

Waterfowl include the swan, stork, crane, white heron, and duck. Other birds are the vulture, burrowing owl, partridge, quail, wild turkey, parakeet, lapwing, cardinal, and hummingbird. The principal reptiles are the lizard, tortoise, and rattlesnake, and a viper called the *vibora de la cruz*. Alligators are found in the upper waters of the Uruguay R. Large spiders are numerous.

Soils. The even distribution of rainfall and the organic matter supplied by the grass cover have resulted in generally highly fertile soils throughout the country. The small floodplains, which occur along the rivers that drain into the Uruguay R., consist of rich alluvial soils. In the s.w., a continuation of the pampas in Argentina is extremely fertile.

THE PEOPLE

The people of Uruguay are predominantly of European origin, many of them foreign-born and coming chiefly from Spain and Italy and

Mounted gauchos round up cattle on a ranch near La Coronilla, in southeastern Uruguay.

Foto Sichel



A gaucho rides a bucking bronco at a rodeo, a popular event in Uruguay.

Foto Sichel



also from Brazil, Argentina, and France. Only about 5 percent are persons of mixed European and American Indian blood. None of the small original Indian population remains.

Population, Political Divisions, and Principal Cities. The population of Uruguay (census 1963) was 2,595,510; the United Nations estimated (1973) 2,992,000. The population density is 43 per sq.mi. (U.N. est. 1973), and is concentrated near the coast. Only 18 percent of the population is rural.

Uruguay is divided into nineteen administrative departments: Artigas, Canelones, Cerro Largo, Colonia, Durazno, Flores, Florida, Lavalleja, Maldonado, Montevideo, Paysandú, Río Negro, Rivera, Rocha, Salto, San José, Soriano, Tacuarembó, and Treinta y Tres.

The principal cities of Uruguay are Montevideo (pop. 1963, 1,154,000; 1972 est., 1,500,000), the capital, chief port, and economic center; Paysandú (pop. latest est., 52,472), a port and center of the meat-packing and frozen-meat

industry; and Salto (pop. latest est., 57,958), a center of commerce, shipping, and the meat-salting and meat-packing industries.

Religion and Language. Freedom of religion is guaranteed by the constitution. Most of the people belong to the Roman Catholic Church. Spanish is the official language.

Education. Uruguay has the lowest rate of illiteracy (9 percent) in Latin America. Primary education is compulsory, and Uruguay is the only nation in the Western Hemisphere in which all education, including college and postgraduate work, is free. In the early 1970's primary schools numbered about 1950 and were annually attended by about 332,000 students; during the same period, about 250 secondary schools had an annual enrollment of about 189,000 students. Institutions of higher education include the University of Montevideo (see MONTEVIDEO, UNIVERSITY OF), annually attended by about 16,200 students; 43 coeducational normal schools; and a college of arts and trades.

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Culture. A western European tradition is widespread in Uruguay today. Most of the native Indians were supplanted by Europeans, chiefly the Spanish and Italians by the 19th century. Since then the country has adopted the cultural institutions of these immigrants. As in Argentina, which has folk music and dances similar to those of Uruguay, the gaucho has been the subject of folklore and music. Colonial literature was largely limited to science, education, and religion. In the 19th century Juan Zorrilla de San Martín (1857–1931) wrote "Tabara", considered one of the genuine epic poems of America. Folk and popular music reflect the mood of the people and of the land. Both the government and thriving middle class support the theater, concerts, museums, and literary publications. Popular sports include soccer, polo, swimming, tennis, and golf. See SPANISH-AMERICAN LITERATURE.

LIBRARIES AND MUSEUMS. All of the major libraries in Uruguay are in Montevideo. They include the National Library; the library of the National Historical Museum, known for its collection of engravings, maps, coins, and native Uruguayan material; the National Congress Library; and the library of the National Archives.

The principal museums include the National Historical Museum, the National Museum of Fine Arts, and the Museum of Natural History, all in Montevideo. The Museo del Indo, in Tacuarembó, has collections of Indian art work, weapons, and implements.

THE ECONOMY

Agriculture, specifically stock raising, is of primary importance in the economy, although manufacturing is increasing in significance. Most of the economy is privately owned, but the government operates such enterprises as the state railways, the administration for electric power and telephones, the Uruguayan Airlines, the official broadcasting service, and the national meat-packing plant. In a recent year budget figures showed some \$111,000,000 in revenues and about \$131,000,000 in expenditures.

Agriculture. Stock raising is the principal agricultural activity of Uruguay and the mainstay of the economy, contributing about 90 percent of Uruguayan exports in the form of meat, wool, and hides. About 90 percent of the land is devoted to grazing. The moderate climate and the even distribution of precipitation make it possible to pasture stock throughout the year. In the early 1970's livestock numbered about 8,500,000 cattle, 19,700,000 sheep, 420,000 horses, and 390,000 hogs. Wool production in the early 1970's was about 54,000 tons annually. About 10

percent of the land is cultivated. The principal crops are wheat, corn, rice, oats, sunflower seeds, barley, and linseed.

Other Economic Activities. Mineral production in Uruguay is comparatively important to the economy. The principal mining activity is the extraction of marble. The leading industrial activities are the manufacture of woolen, cotton, and rayon textiles and the processing of food, primarily meat. Lumbering, oil refining, cement manufacturing, and the production of steel, aluminum, electrical and engineering equipment, and chemicals are also important industries in the country.

Currency, Banking, and Trade. The unit of currency of Uruguay is the peso, consisting of 100 centesimos (889 pesos equal U.S.\$1; 1973). Uruguay has a well-developed banking system, with many private banks. The Bank of the Republic is a state bank, the sole bank of issue, and is both the financial agent of the government and a commercial bank. With its branches, it transacts about one half of the banking business of the country.

Foreign trade plays an important role in the economy of Uruguay. In 1970 annual exports were valued at about \$232,700,000 and imports at about \$233,100,000. The leading trade partners are the United States, the Netherlands, Brazil, Great Britain, and West Germany. Wool, the most important export item, usually accounts for more than 30 percent of total exports. Meats and hides make up about another 40 percent of exports. Tourism, especially from Argentina, is also an important earner of foreign exchange. Uruguay imports raw materials for manufacturing, fuel and lubricants, food products, chemicals and pharmaceuticals, construction materials, machinery and parts, and motor vehicles.

Transportation and Communications. About 90 percent of the Uruguayan railroad system was British-owned until 1947, when it was purchased by the government of Uruguay. The railroad system has about 1900 mi. of standard-gauge track. Several foreign airlines operate flights to and from Uruguay, while a government agency provides domestic air service. Of a total 26,000 mi. of roads, 3100 mi. are surfaced. River transport is extensive; the mileage of navigable waterways is about 800. The merchant marine has some 40 vessels of 100 tons and larger.

In the early 1970's Uruguay had 71 radio broadcasting stations, and 4 television stations. About 30 daily newspapers are published, 18 in Montevideo alone.

Labor. The membership of labor unions in the early 1970's was about 150,000. The chief trade



Scientific research to expand agricultural productivity is in evidence throughout Uruguay. Above: Scientists at the Rubino Institute at Pando, a center for veterinary research, probe for improved health-protection measures for animals. Below: Meteorologists, measuring water levels in the Mirim Lagoon Basin, prepare flood-control and land-reclamation plans.

UN



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union is the Confederation of Uruguayan Trade Unions, which has about 83,000 members in 72 affiliated unions.

GOVERNMENT

In 1966 Uruguay amended its constitution to reestablish a presidential system of government, thus ending a sixteen-year experiment with an unwieldy nine-man executive body, the national council of government. Suffrage is extended to all citizens who have reached eighteen years of age.

Central Government. Executive power is vested in the president, elected by direct popular vote for a five-year term. The president appoints his cabinet, composed of eleven ministers of state, to head the executive departments.

Health and Welfare. The ministry of public health and its various appointed commissions have established health centers and clinics, checked the incidence of tuberculosis, and lowered the infant-mortality rate. In the early 1970's Uruguay had about 4400 physicians to serve its nearly 3,000,000 people. Major fatal illnesses include heart disease, cancer, and dysentery.

The country is noted for its advanced social-welfare programs; coverage includes accidents, occupational illnesses, sickness, old age, maternity, and child welfare. The families subsidies fund issues grants to families; and laws have been passed to protect women and minors in employment.

Legislature. Legislative power is vested in a bicameral parliament, a Senate and a Chamber of Representatives, both elected directly by proportional representation to five-year terms. The Senate has thirty-one members and the Chamber of Representatives, ninety-nine members. Each of the nineteen departments must have at least two representatives in the chamber. The parliament was suspended by presidential decree in June, 1973.

Political Parties. Uruguay has essentially a two-party system, but the two parties, the Blanco Party and the Colorado Party, are divided into a number of often discordant factions. The present electoral system makes it possible for the various factions to nominate candidates for public office as if the factions were representing separate parties. As a result, party unity is difficult to maintain and decisive action difficult to achieve when the government is faced with serious economic problems. The Colorados are generally liberal and the Blancos conservative and Catholic. Among the minor parties are the Christian Democratic Party and the Liberty Party, a coalition in which the largest element is the Communist Party.

Local Government. Each department has an assembly with control and legislative powers and a council with executive and administrative powers; the central government, however, exercises some control over the departments. The Montevideo assembly has sixty-five members and the others have five, while the councils have seven members in Montevideo and five elsewhere. All council and assembly members are popularly elected.

Judiciary. An independent judiciary is headed by a supreme court of justice of five members elected for ten-year terms by the two legislative houses. Four courts of appeal have three judges each. Lower courts consist of 18 courts of first instance in Montevideo, departmental courts in the departmental capitals and other large towns, and justices of the peace in the rural areas.

Defense. Uruguay has an active army of about 12,000, with reserves of about 120,000 men. The navy and air force are small. Military service is not compulsory.

HISTORY

The territory now included in Uruguay was discovered in 1516 by the Spanish explorer Juan Diaz de Solis (1470?-1516), who, with his landing party, was killed that same year by Charrua Indians on the banks of the Río de la Plata. Subsequent attempts at colonization in the territory during the 16th century were discouraged by the warlike Charrua. The first permanent settlement was made in 1624 by the Spanish on the Río Negro.

International Rivalry during the Colonial Period. Contesting Spanish ownership of the region, the Portuguese colonists in Brazil, between 1680 and 1683, established several settlements along the Río de la Plata, opposite Buenos Aires. The Spanish made no attempt to dislodge the Portuguese until 1723, when the latter began fortifying the heights around the Bay of Montevideo. A Spanish expedition from Buenos Aires forced the Portuguese to abandon the site, and there the Spanish founded the city of Montevideo in that year.

Spanish-Portuguese rivalry continued in the 18th century, ending in 1777 with the establishment of Spanish rule in the territory under the jurisdiction of the viceroy of Buenos Aires. In 1810-11 Uruguayan revolutionaries, led by General José Gervasio Artigas (q.v.), joined the patriots of Buenos Aires in revolt against Spain. The Spanish governor was driven from Montevideo in 1814, but in 1816 the Portuguese in Brazil, perceiving that the newly emancipated territory, known as the Banda Oriental (Eastern Shore) del Uruguay, was weak after its struggle with Spain,

invaded the territory, ostensibly to restore order.

The Portuguese conquest was completed in 1820, when the Banda Oriental was annexed to Brazil. Insurgents, the so-called immortal thirty-three, led by Juan Antonio Lavalleja (1786?–1853), reasserted the independence of the country in 1825 and, aided by Argentina, fought a successful war with the Portuguese, who in 1828 recognized Uruguayan independence.

Independence and Civil War. The República Oriental del Uruguay was organized in 1830, but it was soon divided into hostile factions as a result of rivalry between the men who had led the revolt against Brazil. Civil war broke out in 1836 between the adherents of President Manuel Oribe (1796?–1857) and those of the first president, José Fructuoso Rivera (1790?–1854), with the former group called Blancos and the latter Colorados because of the color of their respective white and red flags. During the conflict the Blancos, aided by Argentine forces, besieged Montevideo, which was held by the Colorados from 1843 until 1852. The Colorados aided by Brazil and anti-Argentine forces defeated Oribe and the Blancos. Rivera and the Colorados thereupon took power. The two factions renewed conflict in 1855 and continued it intermittently, with the Colorados retaining control almost continuously after 1865. Between 1865 and 1870 Uruguay was allied with Brazil and Argentina in a war against Paraguay (q.v.).

Early 20th-Century Domestic and Foreign Issues. In the early 20th century membership in the two rival political groups ceased to be merely a matter of traditional loyalties. The Blancos became the conservative party, attracting chiefly the rural population and the clergy, and the Colorados became known as progressives and proponents of advanced social legislation. During the presidency of the progressive José Batlle y Ordóñez (1856–1929), between 1911 and 1915, social legislation was enacted and Uruguay soon became known as the most progressive nation in South America.

In 1917, during World War I, Uruguay broke off relations with Germany and leased German ships, seized in the harbor of Montevideo, to the United States. In that year a new constitution, dividing the executive authority between the president and the national administrative council and providing for the separation of church and state, was promulgated. Uruguay joined the League of Nations in 1919.

In 1933 the demands of President Gabriel Terra (1873–1942), who had taken office in 1931, that the constitution be amended to allow the president wider powers, brought threats of rev-

olution. He thereupon established a dictatorship, and in 1934 the present constitution was drawn up by a constituent assembly. Terra was defeated by Alfredo Baldomir (1884–1948), a Colorado, in the election of 1938.

World War II. In January, 1942, during World War II, Uruguay severed diplomatic, financial, and economic relations with the Axis powers (q.v.). In 1945, near the close of the war, Uruguay signed the Act of Chapultepec and, in 1947, the Treaty of Rio de Janeiro, both providing for the joint defense of the American nations; see CHAPULTEPEC, ACT OF; RIO TREATY. In 1945 Uruguay joined the United Nations.

Postwar Decade. Tomás Berreta (1875–1947), candidate of the Colorado Party and former public works minister, was elected president in 1946, but he died a few months after taking office. Vice-President Luis Batlle Berres (1897–1964) completed the remainder of his term. In 1949 Uruguay concluded a treaty of friendship and commerce with the U.S. The presidential and general assembly elections of 1950 brought Andrés Martínez Trueba (1884–) of the Colorado Party to power. In 1952 a Trueba-sponsored constitutional amendment abolished the presidency and transferred executive power to a nine-member national council of government.

In retaliation against the Uruguayan policy of granting asylum to Argentine political refugees, the Argentine dictator Juan Perón (see under PERÓN) imposed travel and trade restrictions on Uruguay. The government, in protest, severed diplomatic relations with Argentina in January, 1953. In June, the legislature ratified a military-assistance agreement with the U.S. The following year, Uruguay signed an accord with the U.S. providing for collaboration in the peaceful use of atomic energy.

Declining wool prices and curtailed meat exports had led meanwhile to increasing unemployment and inflation. To ease the economic situation, Uruguay entered into trade agreements during 1956 with the People's Republic of China and other Communist countries. The economy continued to deteriorate, however.

In 1958, after ninety-three years of Colorado government, the Blancos were elected by an overwhelming majority. The new government initiated economic reforms; it was faced, however, with leftist agitation and consequent labor unrest, and it charged that Uruguay was being made a base of international Communism. In 1961 the Cuban ambassador and a Soviet diplomat were expelled.

Recent Developments. The Blancos continued in power until 1966. In that year they and

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the Colorados supported a measure for a return to the presidential system, which was approved by referendum in November. In general elections held at the same time the Colorados won, and Oscar Daniel Gestido (1901–67), a retired air force general, was elected president. On Gestido's death, he was succeeded by the vice-president, Jorge Pacheco Areco (1921–). Pacheco's anti-inflationary policies triggered widespread labor and student unrest, and the situation was further complicated by the emergence of a guerrilla organization, the Tupamaros, which sought the overthrow of the government and destruction of capitalism. From June, 1968, until March, 1969, Uruguay remained under modified martial law. A fact-finding visit by Nelson Aldrich Rockefeller (see *under* ROCKEFELLER), then governor of New York State, in June, 1969, was met by violent demonstrations. Pacheco imposed a modified state of siege.

In elections on Nov. 28, 1971, the Colorado candidate, Juan María Bordaberry (1928–), and the Blanco candidate were virtually tied. In February, 1972, the Electoral Court proclaimed Bordaberry president, and he began a five-year term on March 1. He came under continuing pressure, however, both from the Blancos and from dissident factions of his own party. Labor reacted to the government's stringent economic and social policies with strikes throughout 1972 and 1973. Inflation soared, and devaluations of the currency were decreed ten times in 1972 for a total of 21.95 percent in 1973. Strict press censorship was imposed.

In June, 1973, Bordaberry yielded to widespread pressure and dissolved the Congress, creating a council of state to perform congressional functions, oversee the president's activities, and formulate constitutional reforms for a national plebiscite. On the same day the Communist-led National Labor Confederation (C.N.T.) began a general strike, which was broken by the government, after violent confrontations, on July 11. On Aug. 11 the autonomy of the unions was ended and the C.N.T. banned.

Meanwhile the Tupamaros' violence had escalated, and kidnappings and killings became common. After widespread arrests in 1971, some 150 Tupamaros went free in two daring prison breaks. In April, 1972, Congress declared a so-called state of internal war and suspended constitutional guarantees; and some 35,000 police and military men undertook an intensive search for guerrilla hideouts. The state of war was lifted on July 11, but constitutional guarantees were further suspended to late 1973. The influence of the military continued to increase after fourteen

left-wing organizations were outlawed in December, 1973, and Bordaberry announced that no elections would be held in 1976, as had been planned.

As the crackdown on the press, students, labor unions, and opposition leaders continued, the economy worsened, with the cost of living rising another 100 percent in 1974. The peso was devalued many times that year, and the trade surplus of the preceding year turned into a deficit.

URUGUAY, river of South America, rising in the coastal range of s. Brazil, flowing w. on the boundary between the States of Santa Catarina and Rio Grande do Sul, and forming with the Paraná River the Rio de la Plata (qq.v.). It separates Brazil and Uruguay from Argentina and has a course of 1000 mi. It is navigable for large steamers to Concepción del Uruguay, Argentina, and Paysandú, Uruguay, and for smaller vessels to Concordia and Salto in Argentina.

URUMCHI, city in the People's Republic of China, and capital of the Sinkiang-Uigur Autonomous Region, on the Dzungarian steppe at the northern foot of the Tien Shan, 950 miles n.w. of Lanchow and 1500 miles n.w. of Peking. On the Northern Road between Kansu and the Soviet border, it is a caravan trade center and the terminus of the railroad from Lanchow. Nearby to the s. is the Hungyenchih Reservoir, completed in 1953, which irrigates an area around the city. The Ulabai hydroelectric station is also nearby. Industries include cotton-textile milling, motor-vehicle repairing, flour milling, tanning, oilseed processing, printing, and the manufacture of iron and steel, paper, metallurgical products, chemicals, and cement. Coal mines are in the vicinity. Urumchi is the site of Sinkiang University. The city was created in 1945; the name is also spelled Urumtsi and Wu-lu-mu-ch'i. The city was called Tihwa or Ti-hua by the Chinese until 1954. Pop. (1970 est.) 500,000.

USEDOM or **UZNAM**, island belonging since 1945 to East Germany and Poland, in the Baltic Sea, at the mouth of the Oder R., off the n.e. coast of East Germany near the n.w. border of Poland. With the island of Wolin it separates Stettin Bay from Pomeranian Bay, a s. arm of the Baltic Sea. The German-Polish boundary runs n. to s., the greater, w. portion of the island being German. Usedom is 32 mi. long and up to 15 mi. wide, and has an area of 164 sq.mi. The island was owned by Sweden in the 17th century and became a Prussian possession in the 18th century. During World War II Swinemünde (now Świnoujście), the chief town of Polish Usedom, was a Baltic submarine base for Germany; and

Peenemünde, at the N.W. end of the island, was a secret German rocket base. The town of Usedom is the chief center of German Usedom today. Fishing is a major industry.

ÜSKÜB. See SKOPJE.

ÜSKÜDAR. See İSTANBUL.

USSHER, James or USHER, James (1581–1656), Irish prelate and Biblical scholar and chronologist, born in Dublin. Ordained an Anglican clergyman (see CHURCH OF ENGLAND) in 1601, about 1603 he became chancellor of Saint Patrick's Cathedral in Dublin, and in 1607, professor of divinity at the University of Dublin, which office he held for thirteen years. He was made bishop of Meath in 1620, privy councilor for Ireland in 1623, and archbishop of Armagh in 1625. Ussher went to England to conduct research in 1640; soon afterward the Great Rebellion (q.v.) broke out and his property was confiscated. He therefore remained in England, writing and preaching. Upon his death the Lord Protector of England, Oliver Cromwell (see under CROMWELL), gave him burial in the Erasmus Chapel of Westminster Abbey (q.v.), allowing the Church of England burial service to be used on that occasion alone. Of Ussher's numerous writings the most important is the *Annales Veteris et Novi Testamenti* (2 vol., 1650–54; Eng. trans., *Annals of the World* . . . , 1658). In that work he established a chronology of Scripture, with the Creation (q.v.) fixed at 4004 B.C., that was long accepted by scholars and regularly included in the page margins of editions of the Authorized, or King James, Version.

USSURI, river of the Soviet Union, rising in the Sikhote-Alin range in the S.E. Russian S.F.S.R., and flowing 500 miles N. to the Amur R. It forms part of the border between China and the Soviet Union. The Ussuri abounds in fish, and it is used to transport logs.

ÚSTÍ NAD LABEM (Ger. *Aussig*), city in Czechoslovakia, and capital of Severočeský Region, on the Elbe R., 45 miles N.W. of Prague. The principal industries include the manufacture of chemicals, glass, soap, pottery, and woolen and cotton goods. A sugar refinery is also located in the city, and there is considerable trade in grain, fruit, lumber, mineral water, and coal. It has several Gothic and Renaissance churches. Founded in the 13th century, the city was ceded to Germany in 1938 by the Munich Pact (q.v.). It was returned to Czechoslovakia in 1945. Pop. (1970) 74,000.

USTINOV, Peter (Alexander) (1921–), British actor, producer, director, and writer, born in London, England, and educated at the London Theatre School. He is a successful author of

novels and short stories and of more than a score of plays, many of which he himself has acted in. *The Love of Four Colonels* (1951) was the first of his witty and satiric works for the stage to achieve international success. Another of his plays, *Romanoff and Juliet* (London, 1956; New York City, 1958), was made into a motion picture (1961), with Ustinov serving as producer, director, and actor. In 1967 two plays by Ustinov, *The Unknown Soldier and His Wife* and *Halfway up the Tree*, ran simultaneously in New York.

Ustinov received an award as best supporting actor of the year from the Academy of Motion Picture Arts and Sciences for *Spartacus* (1960) and *Topkapi* (1964). *Billy Budd* (1962), a film that Ustinov produced, directed, and acted in, was adapted by him from a novelette by the American writer Herman Melville (q.v.).

UST'-KAMENOGORSK, city of the Soviet Union, in the Kazakh S.S.R., and capital of East Kazakhstan Oblast, on the Irtysh R. at the mouth of the Ul'ba R., 105 miles S.E. of Semipalatinsk and 510 miles N.E. of Alma-Ata. A road hub on a branch of the Turksib Railway, it is a Siberian industrial center, with a large hydroelectric power station on the Irtysh at Ablakotka, 11 miles to the S.E. Industries include zinc smelting, vegetable-oil processing, tanning, metalworking, distilling, and the manufacture of mining equipment, machinery, and chemicals. The city is the site of a teachers' college and of a metallurgical institute of the Kazakh Academy of Sciences. Founded in 1720 as the military post of Ust'-Kamennaya, it became a town in 1868 and was also formerly known as Zashchita. Becoming regional capital in 1939, the city developed industrially during the 1940's. Pop. (1970) 230,000.

USUMACINTA, river of Central America. It is formed by the confluence of the Pasión and the Chixoy rivers, rising in Guatemala. It flows in a winding N.W. course through Guatemala and Mexico, emptying into the Gulf of Campeche. It is about 600 mi. long, and it is navigable for 300 mi. In its middle course it forms the boundary between Mexico and Guatemala.

USURY, in law in the United States and England, a payment of interest (q.v.), by a borrower to a lender for the use of money, in excess of the amount fixed by statute (q.v.). In the U.S. the permissible maximum interest rate varies among the States. All the States fix a legal interest rate, which determines the amount that is collectible in the absence of a definite agreement between the parties, and nearly all States fix a maximum interest rate that may be charged by agreement between the parties. The legal

UTAH

rates range from 5 to 10 percent, and the maximum contract rates range from 6 to 30 percent. Legal rates of interest on small loans by authorized lenders in amounts under \$1000 or, in most States, in amounts under \$300, vary up to 3½ percent per month.

Penalties for violations of the usury laws are varied. In most States the penalty is loss of interest by the creditor; in some States the creditor can recover principal and legal interest, losing only the excess interest; and in a few States a usurious contract is wholly void, and the creditor forfeits both interest and principal.

The charging of different prices for sales on credit (q.v.) or installment payments, as compared with sales for cash, does not make a transaction usurious. Service charges incurred in making the loan likewise are not usurious, unless they can be shown to be a disguise for excessive interest. Only in modern times has payment of interest for the use of money been considered a legitimate form of income. The term "usury" was formerly applied to any kind of interest, and not, as at present, to excessive interest charges.

UTAH, one of the Mountain States of the United States, bounded on the N. by Idaho and Wyoming, on the E. by Wyoming and Colorado, on the S. by Arizona, and on the W. by Nevada. Utah is generally rectangular in shape, measuring about 345 mi. from N. to S. and about 275 mi. from E. to W. The N.W. corner is indented by Wyoming.

Area (11th State in rank)	84,916 sq.mi.
Land	82,096 sq.mi.
Inland water	2820 sq.mi.
Population	(1970, 37th in rank) 1,059,273
	(1960, 38th in rank) 890,627
	(1950) 688,862
Altitude	2000 ft. to 13,528 ft.
Capital and largest city	Salt Lake City (1970) 175,885
Entered Union (45th State)	Jan. 4, 1896
Nickname	The Beehive State
Motto	Industry
Song	"Utah, We Love Thee"
Tree	blue spruce
Flower	sego lily
Bird	seagull

THE LAND

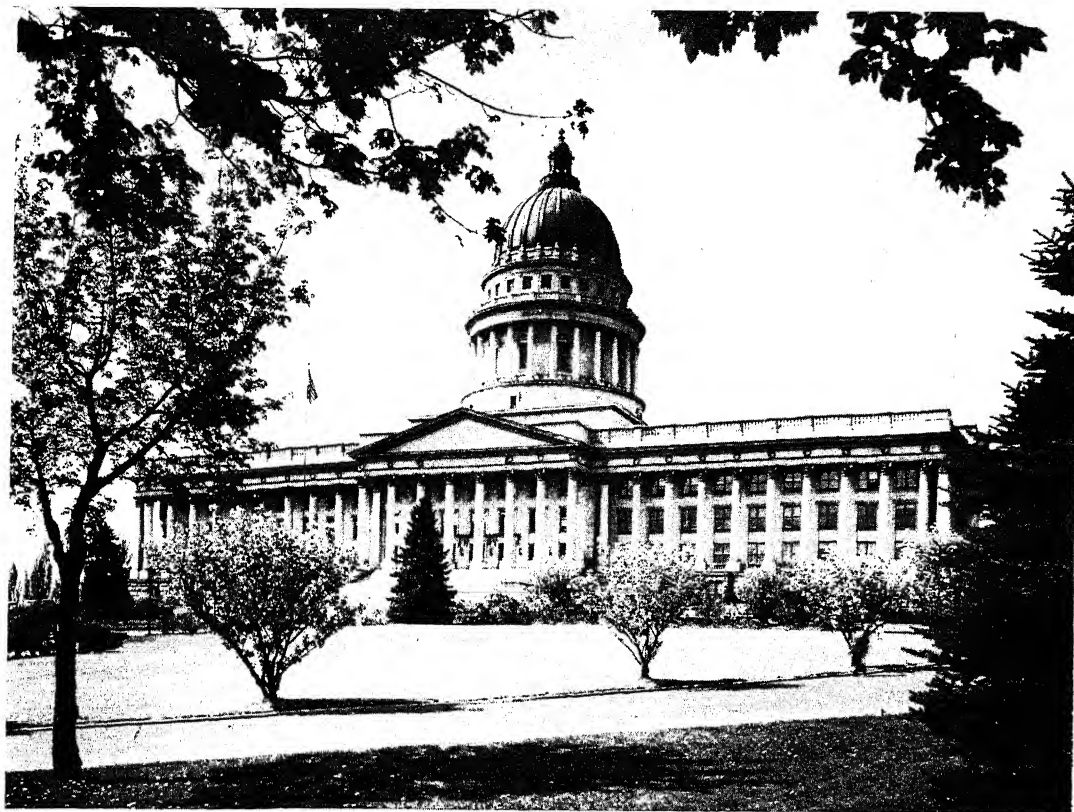
Topographically, Utah has two provinces, an eastern and a western. The provinces are divided by the Wasatch Mts., which enter the State in the N. from Idaho and extend S. for about 150 mi., terminating at Mt. Nebo in the center of the State. The central highland continues S. as the High Plateau to central Arizona. The physiographic region E. of the mountain and highland line is the plateau region, which contains all the higher and more serrate mountains of Utah; the region W. of the Wasatch Mts. and High Plateau comprises a portion of the Great Basin (q.v.), much of which is relatively

flat, with scattered small ranges half buried in the sediments laid down in prehistoric Bonneville Lake (q.v.), a vast inland sea that covered the N.W. part of Utah in the Pleistocene Epoch. The Wasatch Mts. constitute a lofty and picturesque range, with elevations up to 12,000 ft. The highest mountain range in Utah is the Uinta, in the N.E.; it is the only major mountain chain in the U.S. that runs from E. to W. Five peaks of the Uinta exceed 13,000 ft., and Kings Peak (13,528 ft.) is the highest point in the State. The lowest point, 2000 ft., is in Washington County; the average elevation of Utah is 6100 ft. South of the Uinta Mts. are the Henry, La Sal, and Abajo mountains and a group of brilliantly colored sandstone cliffs. The mountains of W. Utah are much lower than those in the E. The relationship of these mountains to the whitish alkaline sediments surrounding them in many places gives them the appearance of islands protruding from water.

Rivers and Lakes. The E. part of Utah is drained by a large number of streams, all of which finally unite to form the great Colorado River (q.v.). Most of the streams flow through deep, steep-sided canyons. A very small area in the extreme N.W. part of the State sends its waters through the Snake R. drainage system to the Pacific Ocean. The remaining part of W. Utah lies within the Great Basin and contributes its waters chiefly to two closed drainage systems, Sevier Lake and Great Salt Lake (q.v.). Utah Lake has an outlet in the Jordan R., which flows into Great Salt Lake. The principal man-made lakes of Utah are Lake Powell (partly in Arizona), formed by Glen Canyon Dam on the Colorado R.; and Flaming Gorge Reservoir (mostly in Wyoming) on the Green R.

Climate. Because of variations in latitude and altitude, Utah has marked differences in climate. Summers are hot but dry in the S. area and cooler in the mountainous N. Winters are generally mild, with occasional cold spells. The highest temperature recorded in the State was 116°

Climate	Milford	Salt Lake City	Wendover
Normal temperatures (in ° F.)			
January maximum	38.4	37.4	36.0
January minimum	12.9	18.5	18.8
July maximum	92.8	92.8	92.0
July minimum	55.8	60.5	66.6
Annual	49.2	51.0	52.2
Normal precipitation (in inches)			
Wettest month	1.04	2.12	.73
Driest month	.51	.68	.22
Annual	8.40	15.17	4.88
Latest frost	May 21	April 12	April 17
Earliest frost	Sept. 26	Nov. 1	Oct. 24
Mean number of days between latest and earliest frosts	128	202	190



The Utah State Capitol in Salt Lake City.

Salt Lake Area Chamber of Commerce

F. (at Saint George); the lowest, -50° F. (at Strawberry Tunnel). Precipitation varies widely, from an average of less than 5 in. annually in the Great Salt Lake Desert to more than 40 in. in some parts of the Wasatch Mts. Snowfall is moderately heavy in the mountains. The average annual number of days with measurable precipitation ranges from 45 at Wendover and 60 at Milford to 86 at Salt Lake City. Strong winds and hail and dust storms occur occasionally; tornadoes are rare.

Plants and Animals. More than 4000 species of plants, ranging from desert species in the s. to alpine vegetation above the timberline, are found in Utah. The density of vegetation varies from abundant in the rich Virgin R. valley of the s.w. where the rare Joshua tree grows, to sparse in the desert areas, where cactus, mesquite, and creosote bush predominate. In the mountains of the n. are excellent stands of timber, mainly Engelmann spruce, blue spruce, Douglas fir, and ponderosa pine. Game and furbearing animals are plentiful; the mule deer is sometimes so abundant that it becomes a pest. The mountain regions have the black bear, cougar or mountain lion, and bobcat. Among other animals are the gray and red foxes, beaver, muskrat, short-tailed weasel, badger, several kinds of ground and tree squirrels, desert and mountain cottontail rab-

bbits, the striped skunk, coyote, white-tailed prairie dog, pronghorn antelope, and bighorn. A herd of buffalo inhabits an island in Great Salt Lake. Utah is crossed by four bird-migration routes; 160 species have been identified on a 50,000-acre sanctuary on islands in Great Salt Lake. Among the rare birds are the golden eagle, found in the mountains, and the great white pelican, found in Great Salt Lake. Ducks and geese abound in season. Seagulls migrate 800 mi. from the Pacific Ocean to Great Salt Lake to nest and raise their young in spring and summer. The black-spotted mountain trout, whitefish, chub, and sucker are native game fish.

Parks, Forests, and Other Places of Interest. The five national parks in Utah are notable for their canyon and mesa scenery and striking erosion forms. Bryce Canyon National Park and Zion National Park are in the s.w., Arches National Park and Canyonlands National Park are in the s.e., and Capitol Reef National Park (qq.v.) is in south-central Utah. Five of the six national monuments mark dramatic geologic formations: Dinosaur National Monument, Natural Bridges National Monument, Timpanogos Cave National Monument (qq.v.), Cedar Breaks National Monument, and Rainbow Bridge National Mon-

INDEX TO MAP OF UTAH

Cities and Towns

American Fork	C 3	La Verkin	A 6
Antimony	C 5	Layton	C 2
Aurora	B 5	Lehi	C 3
Beaver	B 5	Lewiston	C 2
Beryl	A 6	Loa	C 5
Bicknell	C 5	Logan	C 2
Bingham Canyon	B 3	Maeser	E 3
Blanding	E 6	Magna	B 3
Boulder	C 6	Manila	E 3
Bountiful	C 3	Manti	C 4
Brigham City	C 4	Marysville	B 5
Castle Dale	D 4	Mayfield	C 4
Cedar City	A 6	Mexican Hat	E 6
Centerfield	C 4	Midvale	B 3
Circleville	B 5	Milford	A 5
Clearfield	B 2	Minersville	A 5
Coalville	C 3	Moab	E 5
Delta	B 4	Monroe	B 5
Drageron	D 4	Monticello	E 6
Draper	C 3	Morgan	C 2
Duchesne	D 3	Moroni	C 4
Dugway	B 3	Mount Pleasant	C 4
Elsinore	B 5	Murray	C 3
Emery	C 5	Neola	D 3
Enterprise	A 6	Nephi	C 4
Ephraim	C 4	North Ogden	C 2
Escalante	C 6	Ogden	C 2
Eureka	B 4	Orangeville	C 4
Fairview	C 4	Orderville	B 6
Farmington	C 3	Orem	C 3
Ferron	C 4	Panguitch	B 6
Fillmore	B 5	Park City	C 3
Fort Duchesne	E 3	Parowan	C 6
Fountain Green	C 4	Payson	C 3
Garland	B 2	Plain City	B 2
Garrison	A 5	Pleasant Grove	C 3
Grantsville	B 3	Price	D 4
Green River	D 4	Providence	C 2
Gunnison	C 4	Provo	C 3
Hanksville	D 5	Randolph	C 2
Heber City	C 3	Redmond	B 4
Helper	D 4	Richfield	B 5
Hiawatha	D 4	Riverton	B 3
Hinckley	B 4	Roosevelt	D 3
Holden	B 4	Roy	B 2
Holladay	C 3	Saint George	A 6
Huntington	D 4	Salina	C 5
Hurricane	A 6	Salt Lake City (cap.)	C 3
Hyrum	C 2	Sandy	C 3
Jensen	E 3	Santaquin	C 4
Junction	B 5	Scipio	B 4
Kanab	B 6	Smithfield	C 2
Kanosh	B 5	Spanish Fork	C 3
Kaysville	C 2	Springville	C 3
Kearns	B 3	Sunnyside	D 4
La Sal	E 5	Tooele	B 3
		Tremonton	B 2
		Tropic	B 6

○ County seat.

Vernal	E 3
Washington	A 6
Washington Terr.	C 2
Wellington	D 4
Wellsville	B 2
Wendover	A 3

Physical Features

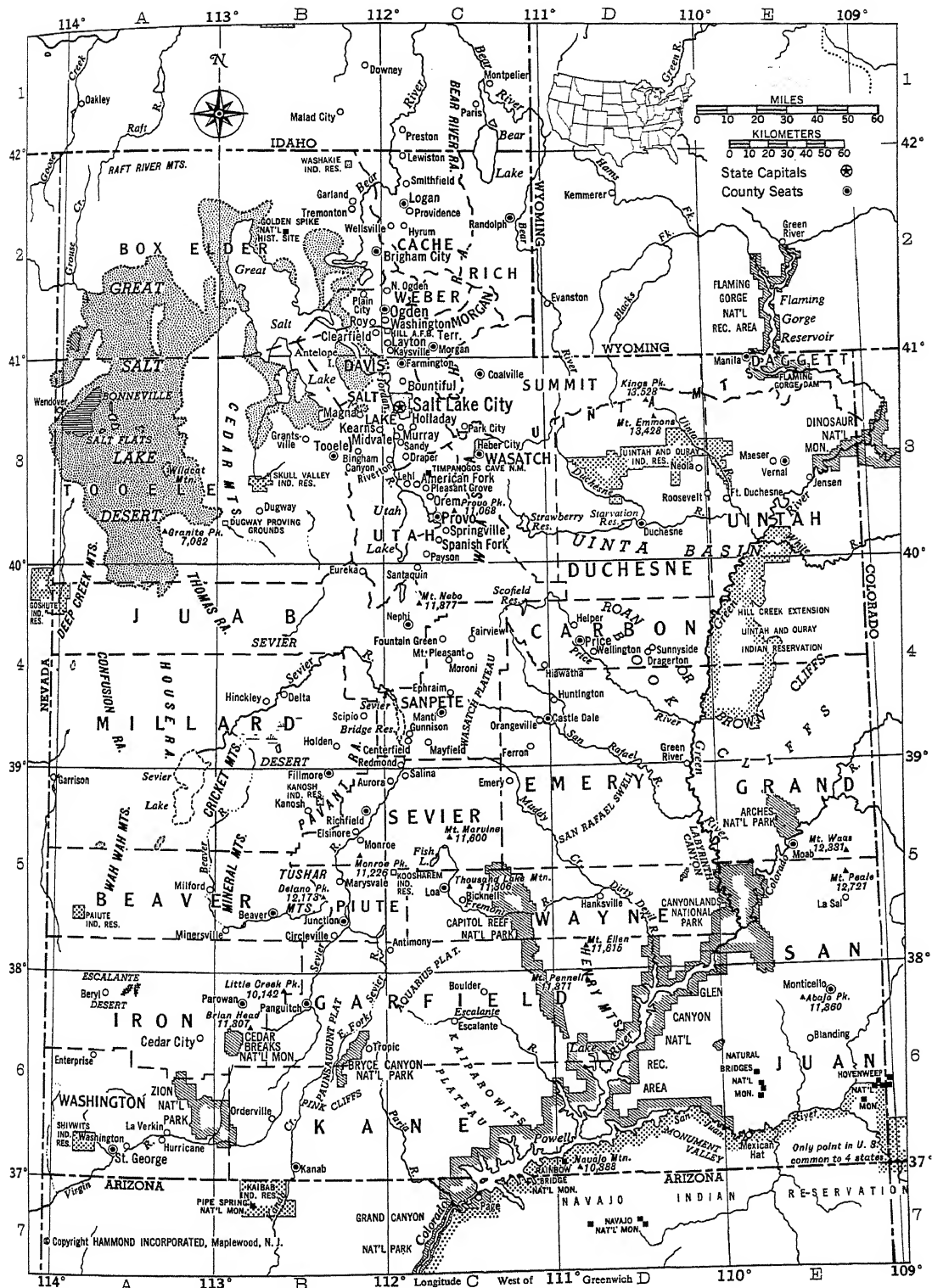
Abajo (peak)	E 6	Grouse (creek)	A 2
Antelope (isl.)	B 2	Henry (mts.)	D 6
Aquarius (plateau)	C 6	Hill A.F.B.	C 2
Arches Nat'l Park	E 5	House (range)	A 4
Bear (lake)	C 1	Hovenweep Nat'l Mon.	E 6
Bear (river)	B 2	Kaiparowits (plateau)	C 6
Bear River (range)	C 1	Kanab (creek)	R 7
Beaver (river)	A 5	Kings (peak)	D 3
Bonneville Flats (salt deposit)	A 3	Labyrinth (canyon)	D 5
Book (cliffs)	D 4	Little Creek (peak)	B 6
Brian Head (mt.)	B 6	Marvine (mt.)	C 5
Brown (Roan) (cliffs)	D, E 4	Mineral (mts.)	B 5
Bryce Canyon Nat'l Park	B 6	Monroe (peak)	B 5
Canyonlands Nat'l Park	D 5	Monument (valley)	D 6
Capitol Reef Nat'l Park	C 5	Muddy (creek)	C 5
Cedar (mts.)	B 3	Natural Bridges Nat'l Mon.	E 6
Cedar Breaks Nat'l Mon.	B 6	Navajo (mt.)	D 6
Colorado (river)	E 5, C 7	Nebo (mt.)	C 4
Confusion (range)	A 4	Paria (river)	C 6
Cricket (mts.)	B 5	Panasaugunt (plateau)	B 6
Deep Creek (mts.)	A 4	Pavant (mts.)	B 5
Delano (peak)	B 5	Peale (mt.)	E 5
Dinosaur Nat'l Mon.	E 3	Pennell (mt.)	D 6
Dirty Devil (river)	D 5	Pink (cliffs)	B 6
Duchesne (river)	D 3	Powell (lake)	C 6
Dugway Proving Grounds	B 3	Price (river)	D 4
East Fork (Sevier) (river)	B 6	Provo (peak)	C 3
Ellen (mt.)	D 5	Raft (river)	A 1
Emmons (mt.)	D 3	Raft River (mts.)	A 2
Escalante (desert)	A 6	Rainbow Bridge Nat'l Mon.	C 6
Escalante (river)	C 6	Roan (cliffs)	D, E 4
Fish (lake)	C 5	San Juan (river)	D 6
Flaming Gorge (dam)	E 3	San Rafael (river)	D 4
Flaming Gorge (res.)	E 2	San Rafael Swell (cliffs)	D 5
Flaming Gorge Nat'l Rec. Area	E 2	Scofield (res.)	C 4
Fremont (river)	C 5	Sevier (desert)	B 4
Glen Canyon Nat'l Rec. Area	D 6	Sevier (lake)	A 5
Golden Spike Nat'l Hist. Site	B 2	Sevier (river)	B 4
Granite (peak)	A 3	Sevier Bridge (res.)	B 4
Great Salt (lake)	B 2	Starvation (res.)	D 3
Great Salt Lake (desert)	A 3	Strawberry (res.)	D 3
Green (river)	D 5	Thomas (range)	A 4
		Thousand Lake (mt.)	C 5
		Timpanogos Cave Nat'l Mon.	C 3
		Tushar (mts.)	B 5
		Uinta (basin)	D 3
		Uinta (mts.)	D 3
		Uinta (river)	D 3
		Utah (lake)	C 3
		Virgin (river)	A 7
		Wasatch (plateau)	C 4
		White (river)	E 3
		Wildcat (mt.)	A 3
		Zion Nat'l Park	A 6

ument. The sixth, Hovenweep National Monument (q.v.), near Blanding (partly in Colorado), contains relics of prehistoric Indians. The Flaming Gorge National Recreation Area, on the Green R. (partly in Wyoming), surrounds Flaming Gorge Reservoir. Nine national forests are wholly or partly in Utah. All offer spectacular scenery, with streams and lakes, gorges and canyons. They are Ashley National Forest, located near Duchesne; Cache National Forest (partly in Idaho), near Brigham; Caribou National Forest (partly in Idaho and Wyoming), near Logan; Dixie National Forest, near Cedar City; Fishlake National Forest (partly in Colorado), near Moab; Sawtooth National Forest (partly in Idaho), in the n.w.; Uinta National Forest, near American Fork; and Wasatch National Forest (partly in

Wyoming), near Salt Lake City. The major portion of Glen Canyon National Recreation Area (q.v.), containing Glen Canyon Dam and Lake Powell, is in Utah; the remainder is in Arizona.

Other places of interest include the Mormon Tabernacle, in Salt Lake City; and the Golden Spike National Historic Site (q.v.), in Promontory, where the Central and the Union Pacific railroads were joined in 1869 to form the first transcontinental line. The Bingham Canyon copper mine is the largest open-pit copper mine in the world. The Bonneville Speedway, an area of 100 sq.mi. covered by a hard salt crust 4 ft. thick, is used to test automobiles for speed.

Sports. Fishing is limited in Utah, but small rivers and lakes in the mountain ranges and a number of man-made lakes provide some sport.



UTAH

Among species found are grayling, whitefish, bluegill, walleye pike, kokanee salmon, and five varieties of trout. Game animals and birds hunted include mule deer, snowshoe hare, jack-rabbit, squirrel, cottontail rabbit, wild turkey, Chukar and Hungarian partridge, Gambel's and California quail, and ruffed, blue, and sage grouse. Antelope, elk, moose, and bighorn sheep are reserved to residents.

Utah has more than twenty ski resorts, including Alta, near Salt Lake City; Mt. Majestic, at Brighton, Snow Basin, near Ogden, Timp Haven, near Provo, and Park City ski resorts. With summits rising above 12,000 ft., the Uinta Mts. offer good climbing. The High Uintas Primitive Area has a network of trails, with the Highline Trail running along the crest of the mountains. Mt. Timpanogos (11,957 ft.) in the Wasatch Range, is of interest to climbers.

THE PEOPLE

According to the 1970 decennial census, the population of Utah was 1,059,273, an increase of 18.9 percent over the 1960 population. The urban segment comprised 851,472 persons, 80.4

percent of the total, compared with 74.9 percent in 1960. The rural segment comprised 207,801 persons, 19.6 percent of the total, compared with 25.1 percent in 1960. Ethnically, the 1970 population was distributed as follows: white persons, 1,031,926; nonwhites, 27,347, including 11,273 Indians, 6,617 Negroes, 4,713 Japanese, and a number of Chinese, Filipinos, and others. The percentage of native-born residents was 97.2; of foreign-born, 2.8 percent. The major countries of origin of the foreign-born, in order of rank, were Germany and Great Britain. The 1970 population density averaged 12.9 per sq. mi., compared with 10.8 in 1960.

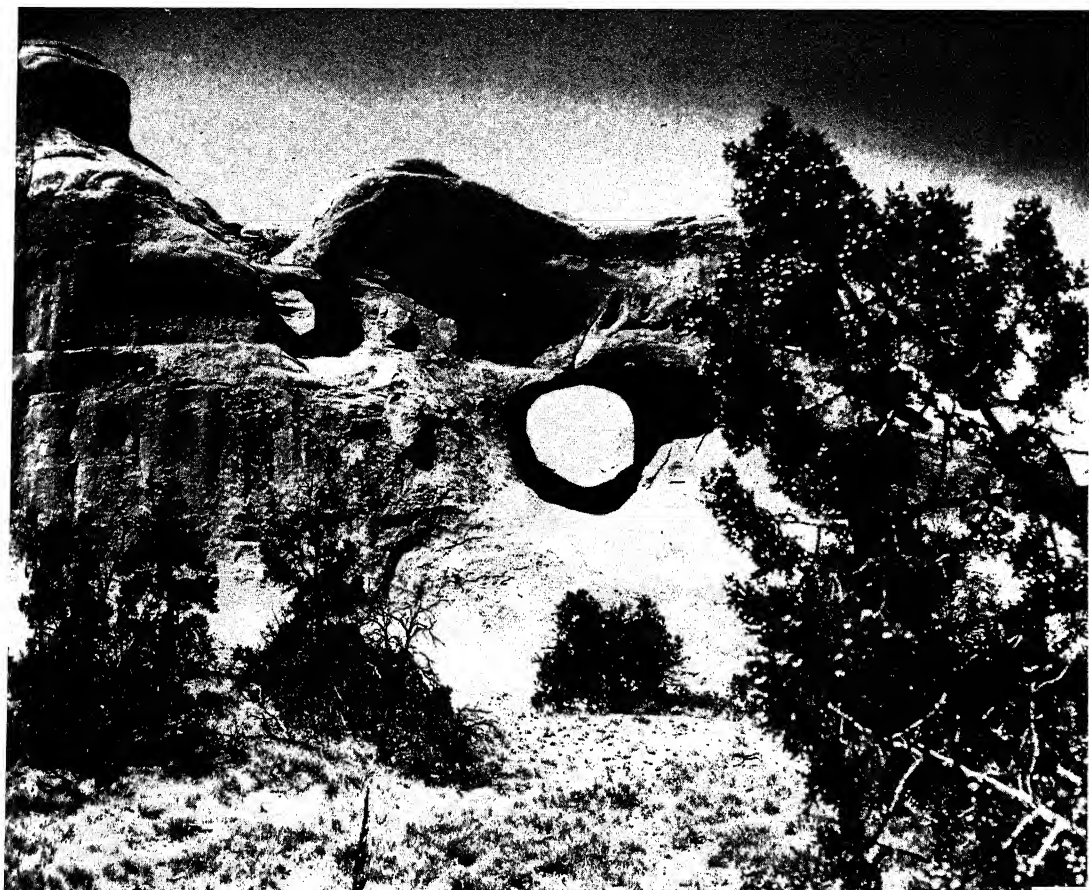
The chief cities, in order of population, are Salt Lake City, the capital, a center of industry, commerce, and transportation, headquarters of the Church of Jesus Christ of Latter-day Saints (Mormon Church), and site of the University of Utah; Ogden, a railroad, manufacturing, and food-processing center; Provo, a resort and agricultural trading center; site of Brigham Young University, and Bountiful and Logan, centers of agricultural areas.

The Navajo reservation is the largest Indian reservation in Utah. It is partly in Arizona and New Mexico, which States have the majority of the Navajo population. A few Ute Indians live in

Monument to Brigham Young, first governor of the Utah Territory, in Salt Lake City. The monument also honors the frontiersman James Bridger and the Ute Indian chief Washakie. In the background is the Mormon Tabernacle.

Salt Lake Area Chamber of Commerce





Tunnel Arch, a feature of Arches National Park, in southeastern Utah.
Norman Van Pelt - Utah Travel Council

the Utah part of the Ute Mountain reservation, which also extends into Colorado and New Mexico. The Goshute tribe occupies reservations at Skull Valley and Goshute; Ute at Uintah and Ouray; and Shoshoni at Washakie.

Education. The public-school system of Utah was established in 1890. Education is compulsory for all children between the ages of six and eighteen.

ELEMENTARY AND SECONDARY SCHOOLS. In the early 1970's public elementary schools numbered about 385 and public secondary schools, about 170. Enrollment was about 213,000 in elementary and about 93,000 in secondary schools. Teachers in the public-school system numbered about 5800 in elementary and about 5500 in secondary schools. In the early 1970's private institutions included about 20 elementary schools with some 3000 students, and about 10 secondary schools with 1000 students. Teachers in private schools numbered about 300 in the late 1960's.

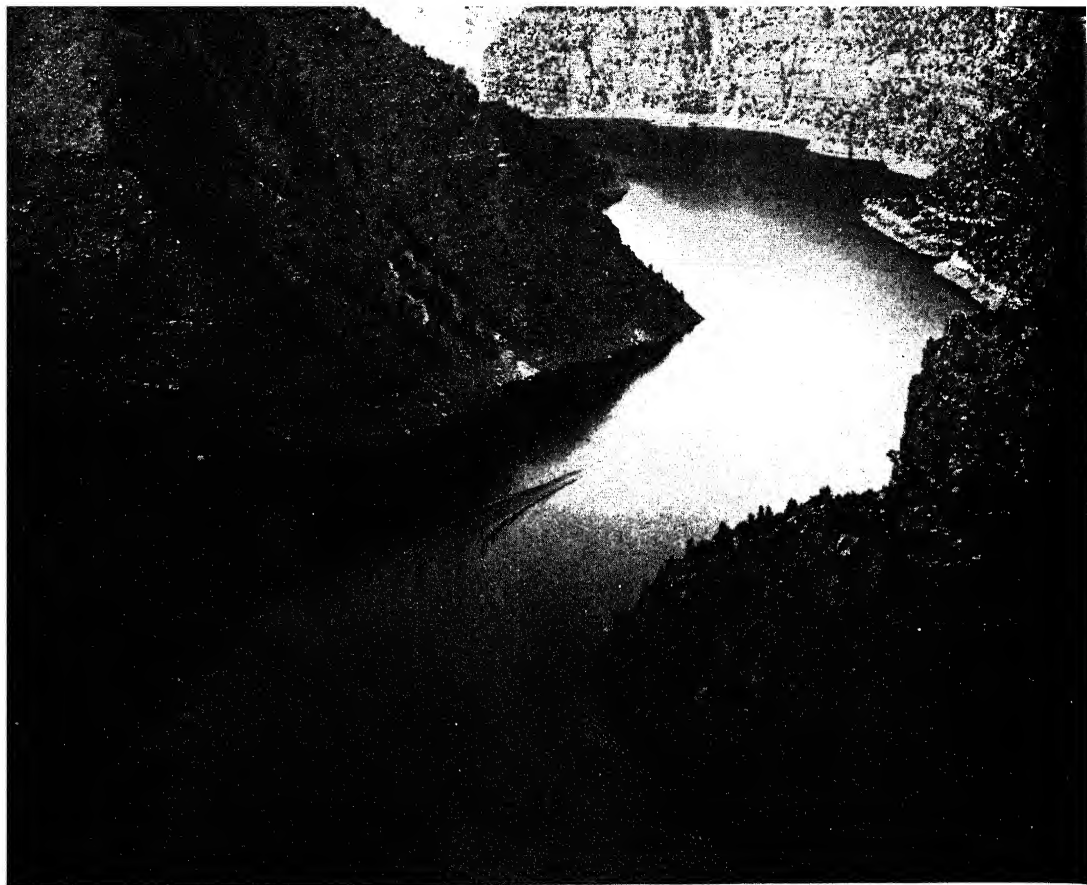
UNIVERSITIES AND COLLEGES. In the early 1970's Utah had thirteen institutions of higher learning, four of which were private. University and college enrollment was about 80,000. Public institutions include the University of Utah (q.v.), Utah State

University, Weber State College, Southern Utah State College, and four junior colleges: Snow College, Dixie College, Stevens Henager College, and the College of Eastern Utah. Private institutions include Brigham Young University (q.v.) and Westminster College.

Libraries and Museums. Utah has about fifty libraries, notably the Salt Lake City Library and the Carnegie Free Library, in Ogden. Others include the State Library, which distributes books in braille to the blind in Utah, Montana, and Wyoming; the University of Utah Library; the Utah Historical Library; and a library of the Mormon Church, all in Salt Lake City. Cultural institutions include the Pioneer Museum, in Provo, which houses Mormon relics; the Utah State Historical Society and the Salt Lake Art Center, both in Salt Lake City; and the Utah Field Museum of Natural History, in Vernal.

THE ECONOMY

Utah has a diversified economy. Per capita personal income was \$5482 in 1976, compared with \$6441 for the U.S. as a whole. Agriculture employs about 5 percent of the State's workers, and



Flaming Gorge Lake, surrounded by deep, sheer cliffs, forested mountains, and breathtaking views, in north-eastern Utah and Wyoming.

Utah Travel Council

mining—particularly copper mining—about 3 percent. Nonagricultural workers are employed, in descending order of numbers, in wholesale and retail trade; government; service industries; manufacturing; transportation and public utilities; construction; and finance, real estate, and insurance. Utah gained from the migration of population from the North and East in the mid-1970's. Salt Lake City's population increased at twice the national rate during the period 1970-77 and the population for the State as a whole increased by more than three times the national average.

Manufacturing. According to a recent survey of manufactures, production workers in Utah total 45,000. The largest numbers are employed in the manufacture of nonelectrical machinery, food, apparel and textiles, fabricated metal products, and transportation equipment, and in printing and publishing. About 67 percent are employed in the Standard Metropolitan Statistical Area (q.v.) of Salt Lake City-Ogden, and 60 percent of these work in Salt Lake City itself. A second manufacturing center is Provo-Orem.

The value added by manufacture (see VALUE) in the State's largest industries in the mid-1970's was about \$212,600,000 for nonelectrical machinery, \$193,000,000 for food and kindred products, \$174,300,000 for transportation equipment, and \$112,700,000 for fabricated metal products. The apparel and textiles industry, although it employed large numbers of people, had a value of only about \$43,100,000, and the values for printing and publishing were about \$80,500,000. The value added by all manufacturing in Utah during the same period was about \$1.36 billion.

Agriculture. Agriculture plays a small but very significant part in Utah's economy. Cattle-raising is by far the most important activity, since farming operations are limited by the necessity of irrigation. More than 22,800 persons work on 12,600 farms covering approximately 13,000,000 acres; the size of an average farm is about 1032 acres. The State's principal commodities in terms of cash receipts are cattle, milk, hay, and turkeys. Important crops other than hay include wheat, barley, and sugar beets. Total cash receipts from agriculture (including government payments) during the mid-1970's were approximately \$364,918,000. Of this total, about

\$262,186,000 was from livestock and about \$97,121,000 was from crops.

Mining. The principal minerals produced in Utah, in order of value, are petroleum, copper, coal, and gold. In the mid-1970's Utah's mineral production was valued at about \$966,000,000 annually, representing nearly 2 percent of the U.S. total. In total value of production Utah ranked nineteenth among the States. In quantity of production the State ranked second nationally in asphalt, copper, and potassium salts; third in gold; and fourth in lead, molybdenum, silver, and vanadium.

Energy. Generating plants in Utah, with a capacity of 1,500,000 kw, produced about 5.7 billion kw hours of electrical energy annually in the mid-1970's. About 21 percent of production and more than 28 percent of capacity were publicly owned. Flaming Gorge Dam, on the Green R., and Glen Canyon Dam in Arizona are sources of a substantial amount of hydroelectric power.

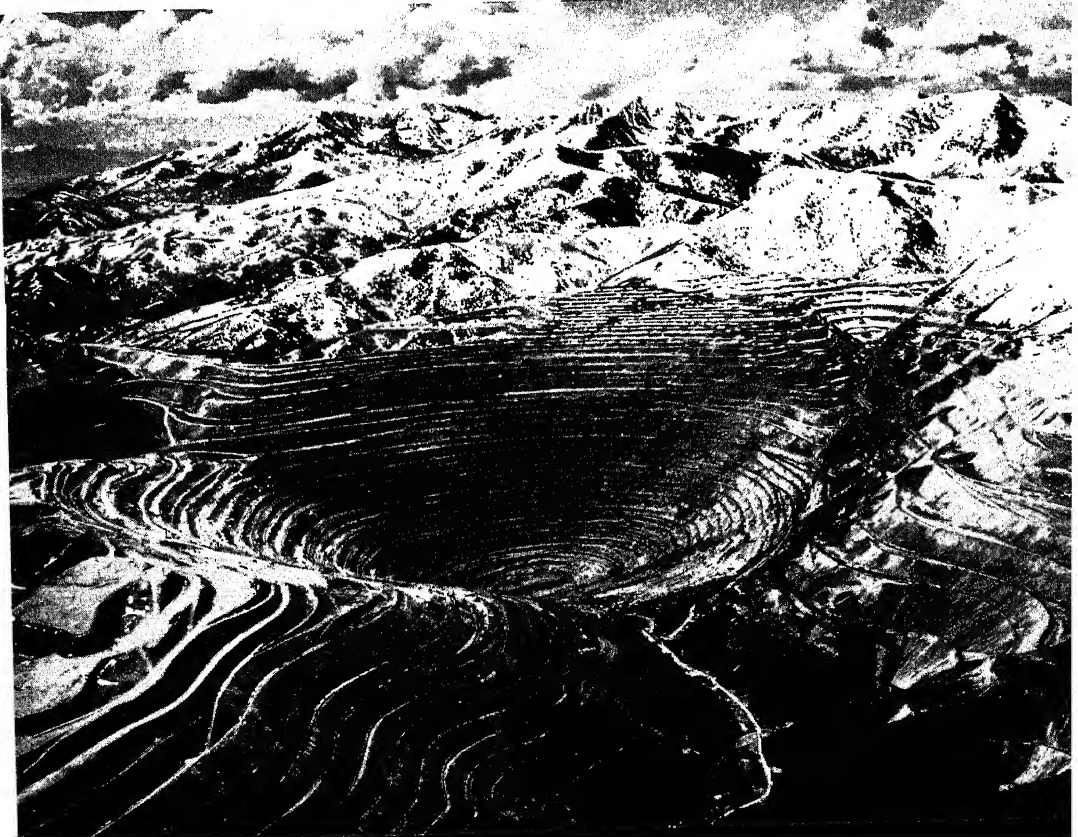
Forestry. The forest land of Utah is predominantly softwoods. The commercial forest land, primarily under public ownership, comprises some 3,800,000 acres. It produces a net annual cut of sawtimber of approximately 70,000,000 bd.ft.

Tourism. The annual number of visitors to Utah is increasing rapidly. Salt Lake City and the national parks and recreation areas are the main attractions for tourists, who spend about \$630,000,000 in the State annually. Fishing, winter sports, and camping are popular recreational activities.

Transportation. The first railroad in Utah was the Union Pacific Railroad, inaugurated in February, 1869. At present the State has a total of about 1726 mi. of railroad line in operation. Rural and municipal roads total some 48,900 mi.; Federally aided primary and secondary roads total about 6553 mi., including 939 mi. in the Interstate Highway System. Utah is served by 5 international airlines and 6 local or interstate lines. In the mid-1970's the State had 55 public and 35 private airports.

Communications. The first newspaper in Utah was the *Deseret News*, founded in Salt Lake City in 1850 and still being published. Today the State has 5 daily newspapers with a total circulation of 258,000 and 4 Sunday papers with a total circulation of 257,000. The leading papers are the Salt Lake City *Deseret News* and *Tribune*, the Ogden *Standard-Examiner*, and the Provo

Bingham Canyon Mine, the largest man-made excavation in the world.
Salt Lake Area Chamber of Commerce



UTAH

Herald. Of some 69 radio stations operating in the mid-1970's, among the oldest was KSL, which was established in 1922 in Salt Lake City. Five television stations were in operation during the same period.

GOVERNMENT

Utah is governed under the constitution of 1895, as amended. Executive authority is vested in a governor, an attorney general, and a secretary of state, all elected for four-year terms, and other elected and appointed officials. Legislative authority is exercised by the Senate, with twenty-eight members elected for four-year terms, and the House of Representatives, with sixty-nine members elected for two-year terms. The legislature meets annually. The judicial system includes a five-member supreme court, district courts, juvenile courts, and justices of the peace. The State is divided into twenty-nine counties.

Utah is represented in the United States Congress by two Senators and two Representatives. **Voting Qualifications.** Suffrage is extended generally to U.S. citizens eighteen years of age who have resided six months in the State and 60 days in the county.

HISTORY

The first Europeans in Utah, sent to the region by the Spanish explorer Francisco Vázquez de Coronado (q.v.), reached the Colorado R. in 1540. Two Franciscan friars, seeking a direct route to the Pacific, went from Santa Fe to Utah Lake in 1776. In the winter of 1824-25, James Bridger (q.v.), an American trapper, seeking to determine the course of the Bear R., discovered the Great Salt Lake. Other trappers followed and set up posts in the region. Later, immigrants to California and Oregon passed through Utah.

The Mormons. In 1846 the Mormons (q.v.), despairing of peace elsewhere, determined to move west. On July 21, 1847, a group of about 150 pioneers reached the present site of Salt Lake City. Other bands of Mormons followed, and by 1852 the Mormons, members of the Church of Jesus Christ of Latter-day Saints, numbered 15,000 in Utah. The U.S. did not obtain possession of the region, which then belonged to Mexico, until the Treaty of Guadalupe Hidalgo in 1848 ending the Mexican War (q.v.), and did not immediately provide for its government. At first the church officers exercised governmental functions, but with the coming of non-Mormons in 1849 the people of the region established the state of Deseret, adopted a constitution, and sent a delegate to the United States Congress to ask for admission to the Union. In the same year the Mormons established the Perpetual Emigration Fund, which

was organized to bring thousands of proselytes from Europe to Utah. Congress refused to admit the state because the Mormon Church permitted polygamy; but in 1850 it established the region as the Territory of Utah, and Brigham Young (q.v.), who had led the first band to Salt Lake City, was appointed governor.

A Struggle for Statehood. In 1854 and 1856 admission to the Union was sought but refused by Congress. In 1862 the U.S. government passed a law against polygamy. Meanwhile, the incoming of non-Mormons to the territory was viewed by the Mormons with disfavor, and in 1857 a party of non-Mormon immigrants was attacked by a band of Mormons and Indians. The immigrants surrendered, but all except seventeen children were thereupon killed. The leader of the Mormon group was executed for murder. In the same year a possible rebellion was reported, and President James Buchanan (q.v.) sent United States Army troops to the territory. After the Civil War, the opening of the transcontinental railroad in 1869 brought more non-Mormons to the territory. In 1882 Congress passed the Edwards Bill, which disfranchised polygamists. Continued agitation for Statehood brought no result. In 1887 another act against polygamy was passed by Congress, abolishing the corporation of the Mormon Church and the Perpetual Emigration Fund. During this period the Federal government had been having difficulty in enforcing its laws because of the failure of Mormon juries to indict or convict. After it was held constitutional for juries in Utah to consist entirely of non-Mormons, prominent officials were convicted and sent to the penitentiary. By 1890, 468 men had been convicted of polygamy, and President Wilford Woodruff (1807-98) of the Mormon Church issued a manifesto declaring that the church no longer countenanced polygamy. His action was approved by a general conference of the church. In 1893 amnesty was declared by the Federal government for all offenders who could show that they had not broken the law since 1890. Congress passed an enabling act in 1894 and the State was admitted to the Union on Jan. 4, 1896. The State constitution prohibits polygamy.

Utah's economy developed greatly in the first quarter of the 20th century. Copper production and the smelting industry grew rapidly, and irrigation projects vastly increased arable lands. Although Utah's unemployment rate in the 1930's Depression was one of the nation's highest, the economy recovered during World War II. After the war the Federal government, which owns about 70 percent of Utah's land, expanded its



Immigrants on their way to settle in California passed through Utah. A westbound family traveling in an ox-drawn covered wagon sees the Great Salt Lake Valley.

Library of Congress

military installations, and by the late 1950's Utah was playing a leading role in missile production. The economy prospered further when uranium, oil, and gas fields were discovered. Today, however, the State faces the dual challenge of encouraging continued industrial expansion while at the same time also working to protect its environment.

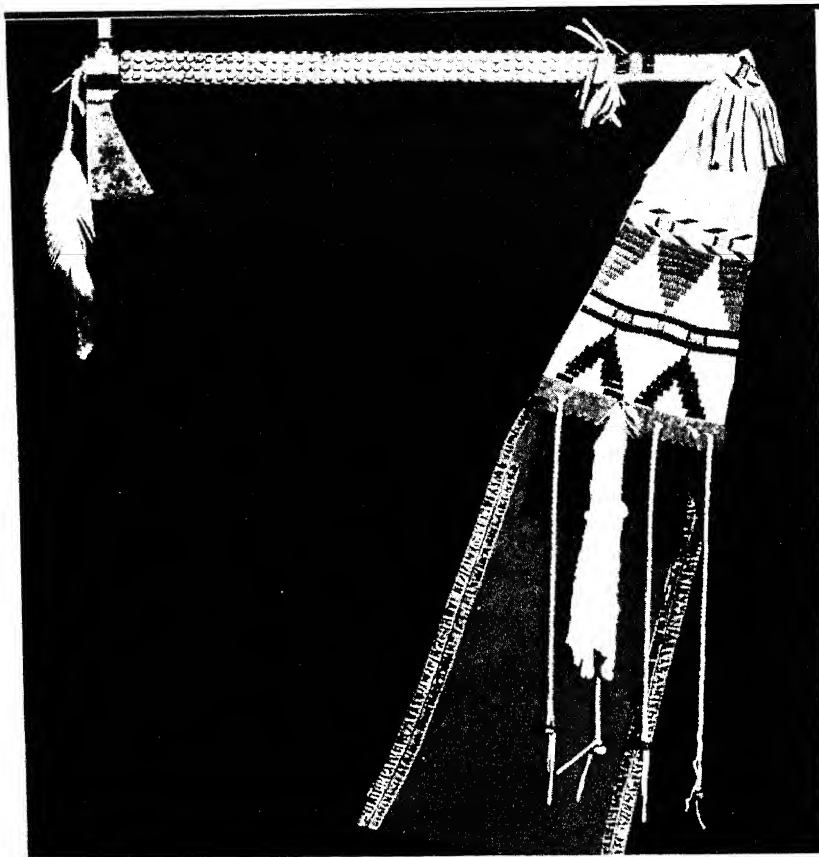
UTAH, LAKE, freshwater lake in N. central Utah, in Utah Co., about 30 miles S. of Salt Lake City. It is about 24 mi. long and 8 mi. wide, and discharges into the Great Salt Lake through the Jordan R. Lake Utah covers about 140 sq.mi.

UTAH, UNIVERSITY OF, coeducational State-controlled institution of higher learning in Salt Lake City, Utah, with a branch, the College of Eastern Utah, in Price. The university, founded in 1850 as the University of Deseret, was closed after one year because of lack of financial support. In 1867 it was reopened as a commercial college; in 1869 the college was reorganized to include educational and classical departments, and in 1892 it was rechartered under its present name. The university comprises colleges of business, engineering, fine arts, health, humanities, law, medicine, mines and mineral industries, nursing, pharmacy, science, and social and behavioral sciences; graduate schools of education and of social work; and divisions of continuing education and international education. The degrees of bachelor, master, and doctor are granted. In 1973 the university libraries housed about 1,500,000 volumes. In 1973 student enrollment totaled about 21,000, the faculty numbered 2566, and the endowment was about \$6,500,000.

UTE, North American Indian tribe of the Shoshonean branch of the Uto-Aztecan language family; see *AMERICAN INDIAN LANGUAGES: Classification of Languages*. The Ute were spread through central and western Colorado, eastern Utah, and northwestern New Mexico. The tribe was subdivided into bands, of which the principal were the Tabeguache, Muache, Capote, Wiminuche, Yampa, and Uinta. A restless, warlike, and aggressive people, they lived entirely by hunting and on wild fruits and roots. Their native arts were simple, but by trade with the Navaho and Piute they obtained blankets and baskets. From the Mexicans and by raids on other tribes they procured herds of horses, sheep, and cattle. Their ordinary dwelling was, in early times, a brush shelter and, later, a small tepee.

The Ute made their first treaty with the United States government in 1850, and by various subsequent treaties were limited in range until the entire body, with the exception of the southern Ute, were removed to the present reservation in Utah. In 1902, claiming that they could not live upon their reserve, the southern Ute moved up to the headwaters of the South Fork of the Platte R. They were subsequently moved by the government to Fort Mead, S.Dak., and about a year later returned of their own volition to their reservation.

The Ute are believed never to have numbered more than 10,000. Presently there are about 4000, mostly on reservations in Colorado, New



Elaborately ornamented pipe tomahawk of the Ute tribe.

Museum of the American Indian

Mexico, and Utah. The name of the latter State derives from the name of the tribe.

See also AMERICAN INDIANS: *Indians of the United States and Canada.*

UTERUS, or WOMB, flattened, pear-shaped, hollow organ in the pelvis of the human female and most other mammals. It is in pregnancy the organ that holds the unborn developing child. See FERTILIZATION; FETUS; GESTATION.

The uterus consists of a body, a base or fundus, a neck or cervix, and a mouth. Suspended in the pelvis, it lies with the base directed upward and forward and the cervix directed slightly backward. It is connected to the vagina by the cervix. On either side of the uterus lies an ovary (q.v.). Eggs produced by the ovaries reach the uterus through the Fallopian tubes (q.v.). In the unimpregnated condition the uterus is about 3 in. in length, 2 in. in breadth, and 1 in. in thickness. In pregnancy the fertilized egg implants itself in the lining of the uterus where it grows to maturity; the walls of the uterus are elastic and stretch during pregnancy to hold the developing child. Although the uterus is a muscular organ it has a lining of soft glandular material, which during ovulation, thickens with blood preparatory to receiving a fertilized ovum. If fertilization does not occur,

this lining breaks down in a process called menstruation (q.v.).

The uterus is prone to infection (q.v.). Endometritis, an inflammation of the mucous lining of the uterus, may be confined either to the neck or the body of the organ or may affect both. Cancer (q.v.) and fibroid tumors (see TUMOR) of the uterus are fairly frequent.

See also REPRODUCTIVE SYSTEM.

U THANT. See THANT, U.

UTICA, city in New York, and county seat of Oneida Co., on the Mohawk R. and the New York State Barge Canal, 85 miles N.W. of Albany. It is served by railroad and canal barges, and maintains a municipal airport. The surrounding Mohawk Valley is a rich farming and dairying area. The city is an important wholesale and retail trading center and a leading center for the manufacture of textiles and textile products. Other noteworthy products include sporting goods, paper products, machinery, and heating, ventilating, air-conditioning, and refrigerating equipment.

History. A British fort was built on the site of the city in 1758, during the French and Indian War, but was soon abandoned. A settlement was established there in 1773 but was destroyed by the British and Indians during the American

Revolution. The first permanent settlement was established after the Revolution. Utica was incorporated as a village in 1798 and as a city in 1832. Pop. (1960) 100,410; (1970) 91,611.

UTICA, ancient city and seaport of N. Africa (in what is now Tunisia), at the N.W. extremity of the Gulf of Tunis and about 20 mi. from the modern city of Tunis. It is said to have been founded as a Phoenician colony about 1100 B.C. It became a flourishing port, although it was later eclipsed by the power of Carthage, which lay about 15½ mi. to the S.E. Utica played an important part in the Punic Wars (q.v.), the three great wars between Rome and Carthage. The city submitted to Rome early in the Third Punic War (149–146 B.C.) and was rewarded with a large share of Carthaginian territory and made the capital of the Roman province of Africa. In the civil war between the two rival Roman leaders, Gaius Julius Caesar (q.v.) and Gnaeus Pompeius Magnus, known as Pompey the Great (see under POMPEIUS), Utica became famous as a rallying point of the adherents of Pompey after the Battle of Pharsalus (q.v.) in 48 B.C. The city received municipal rights under the emperor Augustus (q.v.); under the emperor Hadrian (q.v.) it became a Roman colony, at this time an honorary title. It was captured by the Vandals (q.v.) under Genseric (q.v.) in 439 A.D., regained by the Byzantines in 534 A.D., and finally destroyed by the Arabs toward the end of the 7th century. The few ruins visible aboveground lie W. of the Medgerda R. (anc. Bagradas), and include an amphitheater capable of holding 20,000 spectators, a theater, baths, reservoirs, and quays. Originally on the shore, the site is now 5 mi. inland because of changes in the coast line.

UTILITARIANISM (Lat. *utilis*, "useful"), in ethics (q.v.), the doctrine that what is useful is good, and consequently, that the ethical value of conduct is determined by the utility of its results. The term "utilitarianism" is more specifically applied to the proposition that the supreme objective of moral action is the achievement of the greatest happiness for the greatest number. This objective is considered also to be the aim of all legislation and the ultimate criterion of all social institutions. The utilitarian theory of ethics is generally opposed to the ethical doctrine in which some inner sense or faculty, often called the conscience, is made the absolute arbiter of right and wrong. Utilitarianism is likewise at variance with the view that moral distinctions depend upon the will of God, and with the view that the pleasure given by an act to the individual alone who performs it is the decisive test of good and evil.

Early Forerunners. Utilitarianism is decidedly a modern theory. In ancient times all hedonistic philosophies were more or less individualistic, that is, the happiness of the agent rather than that of his fellow beings (mankind in general) was regarded as the ultimate end of all rational action. According to utilitarian theory, even Christianity contains a hedonistic element and makes its appeal to the individual's desire for his own everlasting happiness, although according to Christian ethics the future happiness of the individual is largely determined by the extent of his devotion to the welfare of his neighbors. In the hedonistic systems of Greek philosophy (see GREEK PHILOSOPHY: *Hellenistic Philosophers*; HEDONISM), the consideration given by the individual to the well-being of his fellow men is based upon the hypothesis that such consideration gives happiness to the individual himself. In modern times the 17th-century English philosopher Thomas Hobbes is the foremost exponent of this individualistic hedonism.

The principle of the greatest happiness for the greatest number was perhaps first expounded by the 18th-century Scottish philosopher Francis Hutcheson in his *Inquiry Concerning Moral Good and Evil* (1725), *Illustrations upon the Moral Sense* (1728), and *System of Moral Philosophy* (1775).

Work of Paley and Bentham. Utilitarianism was enunciated in its most characteristic form, however, by the British theologian William Paley in his *Principles of Moral and Political Philosophy* (1785), and by the British jurist and philosopher Jeremy Bentham in his *Introduction to the Principles of Morals and Legislation* (1789). In the work of Paley, utilitarianism is combined with both individualistic hedonism and theological authoritarianism, as illustrated in his definition of virtue as "the doing [of] good to mankind, in obedience to the will of God, and for the sake of everlasting happiness". With Bentham the utilitarian theory is employed as a foundation, not merely of an ethical system, but also of legal and political reforms. He maintained the necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, and so posited as the ethical goal of human society the greatest happiness of the greatest number.

Bentham sought to illustrate the doctrine of utilitarianism by counterposing it to the doctrine of asceticism (q.v.) on the one hand and to the theory of sympathy and antipathy on the other. Asceticism he defined as the principle that pleasure should be forfeited, and pain in-

UTILITARIANISM

curred, without expectation of any recompense. The theory of sympathy and antipathy he held to be based upon "the principle which approves or disapproves of certain actions, not on account of their tending to augment the happiness, nor yet on account of their tending to diminish the happiness of the party whose interest is in question, but merely because a



Francis Hutcheson (aquatint engraving by the 18th-century Italian artist Francesco Bartolozzi of a contemporary medallion)
Granger Collection

man finds himself disposed to approve or disapprove of them: holding up that approbation or disapprobation as a sufficient reason for itself, and disclaiming the necessity of looking out for any extrinsic ground". In his exposition of the theory of utilitarianism, however, Bentham postulated "four sanctions or sources of pain and pleasure", namely, the physical, the moral, the religious, and the political. The physical sanction, according to Bentham, is the basis of all the others. He sought further to devise a scale of pleasures and pains, rating them in terms of their intensity, purity, duration, propinquity or remoteness, certainty, fruitfulness, and the extent to which pleasure and pain are shared among the greatest number of people.

After Bentham. Other notable exponents were the British jurist John Austin (1790–1859) and the British philosophers James Mill and John Stuart Mill. Austin set forth a strong defense of the utilitarian theory in his *Province of Jurisprudence Determined* (1832). James Mill interpreted and popularized the theory in a number of articles contributed for the most part to the *Westminster Review*, a periodical founded by Bentham and others to promote the spread of the utilitarian philosophy. John Stuart Mill,

who made utilitarianism the subject of one of his philosophical treatises (*Utilitarianism*, 1863), is the ablest champion of the doctrine after Bentham. His contribution to the theory consists in his recognition of distinctions of quality, in addition to those of intensity, among pleasures. Thus, whereas Bentham maintained that, "the quality of pleasure being equal, push-pin [a child's game] is as good as poetry", Mill contended that "it is better to be a human being dissatisfied than a pig satisfied", that is, human discontent is better than swinish fulfillment. By this statement Mill seems to have rejected the identification of the concept "happiness" with "pleasure and the absence of pain" and the concept "unhappiness" with "pain and the absence of pleasure", as found in Bentham's works and in his own earlier formulations. The British philosopher Henry Sidgwick (1838–1901), a contemporary disciple of Mill, gave a comprehensive presentation of Mill's utilitarianism in his *Methods of Ethics* (1874). Somewhat later, the British philosophers Herbert Spencer and Sir Leslie Stephen, the former in his *Data of Ethics* (1879), the latter in his *Science of Ethics* (1882), sought to synthesize the utilitarian theory with the principles of biological evolution as expounded in the works of the British naturalist Charles Robert Darwin. Both the American philosopher and psychologist William James and the American philosopher, psychologist, and educator John Dewey were influenced by utilitarianism. Dewey substituted intelligence for pleasure, or happiness, both as the supreme value and as the most reliable method of achieving other desirable values.

Evaluation. Utilitarianism has frequently been criticized for its psychological atomism, its assumption that pleasures and pains are commensurable, and its inadequate analysis of the concepts of obligation and duty, which seem sometimes to have validity apart from consequences. If one of the essential elements in justice, as a principle of desert or distribution of punishment, is equality, then it is demonstrable that the just action is not always the action that will produce the greatest amount of human welfare, whether welfare is defined in terms of pleasure or happiness. It is true that justice is associated with some degree of human well-being; otherwise we would have to assert that there is no essential difference between saying that "justice consists in treating human beings in the same or similar circumstances equally" and saying that "justice consists in mistreating human beings in the same or similar circumstances equally". Yet justice cannot be reduced

to well-being. When Bentham urges his utilitarian maxim be applied in social situations with the assumption that "each is to count for one and no more than one", this assumption is clearly a principle of justice that cannot be justified merely by its utility. Despite the logical and psychological difficulties, the influence of utilitarianism in humanizing and civilizing the social life of the 19th century, especially in Anglo-American countries, was more profound than any other social philosophy.

See separate biographies for persons whose birth and death dates are not given. S.H.

UTO-AZTECAN LANGUAGES. See AMERICAN INDIAN LANGUAGES: *Classification of Languages: Central Groups.*

UTOPIA (Gr. *ou*, "no"; *topos*, "place"), name of the island home of the ideal society depicted by the English statesman and writer Sir Thomas More (q.v.) in his major work *Utopia* (1516). More presented a community where all sociopolitical ills had been eliminated and all was rationally reformed to benefit the group as a whole. Since the initial success of his work, the adjective "utopian", usually implying impracticability, has been applied to all portrayals of the perfect community.

UTRECHT, city in the Netherlands, and capital of Utrecht Province, on an arm of the Rhine R., about 20 miles s.e. of Amsterdam. The main industries are metal-processing and chemical and food production. The most outstanding architectural landmark in the city is the Cathedral of Saint Martin, built in the 13th century. The State University of Utrecht is also in the city; see **UTRECHT, STATE UNIVERSITY OF**. Utrecht is one of the oldest cities of the Netherlands, and is famous for the nine distinct treaties concluded there on April 11, 1713, which brought to a close the War of the Spanish Succession. See **SPANISH SUCCESSION, WAR OF THE Pop.** (1972 est.) 274,974.

UTRECHT, PEACE OF, general designation for a number of treaties concluded between the years 1713 and 1715 that brought to an end the War of the Spanish Succession. See **SPANISH SUCCESSION, WAR OF THE**. On April 11, 1713, the most important treaties were signed at Utrecht, in the Netherlands, between France and, respectively, Great Britain, the Netherlands, Prussia, Savoy, and Portugal. The main agreements reached involved the ceding of European and North American lands by France, the relinquishing of pretensions to the French throne by Spain, the recognition of the succession of the house of Hannover to the British throne by France, and the granting of most-favored-nation status to Great Britain and the Netherlands by France and

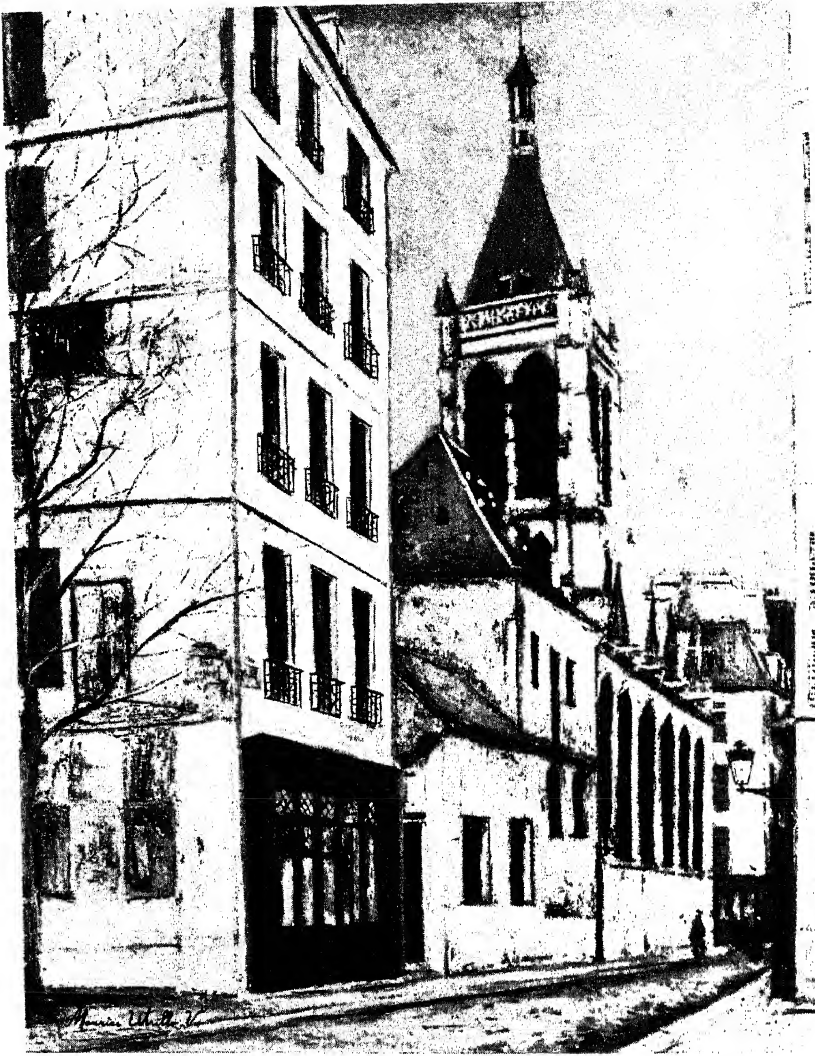
to France by Great Britain. Spain concluded a treaty on July 13, 1713, ceding territories and sole rights to the Spanish-American slave trade to Great Britain; a commercial and peacemaking treaty on June 26, 1714, with the Netherlands; and a similar treaty in February, 1715, with Portugal. A border-settling and definitive peacemaking treaty between France and the Holy Roman Empire was signed at Rastatt (now in West Germany) on March 7, 1714, and validated at Baden, Switzerland, on Sept. 7, 1715. The Peace of Utrecht ended French expansion and facilitated the growth of the British Empire.

UTRECHT, STATE UNIVERSITY OF, coeducational, autonomous institution of higher learning, located in Utrecht, the Netherlands. It is under the jurisdiction of the ministry of education and is supported by the national government. The university was founded in 1636. It comprises faculties of theology, law, medicine, science, arts, veterinary medicine, and social sciences. Depending on the field of study the *kandidaat* examination is taken after two to four years of study and the *doctoraal* examination after an additional two to three years of study. The longer courses of study for the *kandidaat* and *doctoraal* examinations are about the equivalent of work for the degrees of bachelor and master in America. The degree of *Doctoraat* is awarded upon completion of a thesis. The library contains 900,000 bound volumes and 2500 manuscripts. In 1972-73 student enrollment was 18,670; the faculty numbered 610.

UTRILLO, Maurice (1883-1955), French painter, born in Paris, the son of Suzanne Valadon (1867-1938), at the time a model for the French painters Pierre Auguste Renoir, Hilaire Germaine Edgar Degas, and Toulouse-Lautrec (qq.v.), and later herself a painter of recognized talent. The name Utrillo was given to him through his legal adoption by a Spanish writer, Miguel Utrillo. An alcoholic early in his life, Maurice was encouraged by his mother to paint as a form of therapy; she was his only art teacher.

Utrillo's earliest work, painted under the influence of the impressionists (see **IMPRESSIONISM**), is prevailingly delicate in color and comprises townscapes painted at Pierrefitte and Montmagny, suburbs north of Paris. The period in Utrillo's career during which these works were painted, extending from about 1904 to 1908, is generally known as the Montmagny period. From 1909 to 1914 Utrillo painted with a greatly limited palette dominated by shades of white. This period, known as his White Period, marks both the development of Utrillo's personal style

UTRILLO



"The Church of Saint Séverin" by Maurice Utrillo.

National Gallery of Art,
Chester Dale Collector

and the years of his greatest experimentation. In some of the paintings the colors are applied with a palette knife, rather than a brush, to simulate the texture of the walls of plastered buildings; in others, the influence of cubism (q.v.) is clearly discernible.

Utrillo's numerous canvases of empty, picturesque Parisian streets, village scenes, and cathedrals, usually invested with somber pathos or grandeur, won him a worldwide reputation. The signature on his paintings was usually "Maurice Utrillo, V.", the initial standing for his mother's surname. Among his better-known works are "L'Eglise de la Ferté-Milon" ("The Church of the Ferté-Milon", about 1910, San Francisco Museum of Art, San Francisco, Calif.), "Rue de Village" ("Village Street", 1912, The Glasgow Art Gallery, Glasgow, Scotland), and "Rue Saint-

Vincent" ("Saint-Vincent Street", 1913, The Art Institute of Chicago, Chicago, Ill.).

UTSUNOMIYA, city in Japan, and capital of Tochigi Prefecture, on Honshu Island, 62 miles N. of Tokyo. It is a tobacco-processing and trade center, and is also a tourist resort. Pop. (1970) 301,000.

UVALDE, city in Texas, and county seat of Uvalde Co., on the Leona R., about 72 miles W. of San Antonio. A marketing and shipping center for an area where sheep, goats, and cattle are raised, the city has some manufacturing. It is the site of Southwest Texas Junior College, founded in 1946. Settled in 1854, Uvalde was incorporated as a town in 1886 and chartered as a city in 1921. Pop. (1960) 10,293; (1970) 10,764.

UZBEK SOVIET SOCIALIST REPUBLIC, or **UZBEKISTAN**, constituent republic of the Soviet

UZBEK SOVIET SOCIALIST REPUBLIC

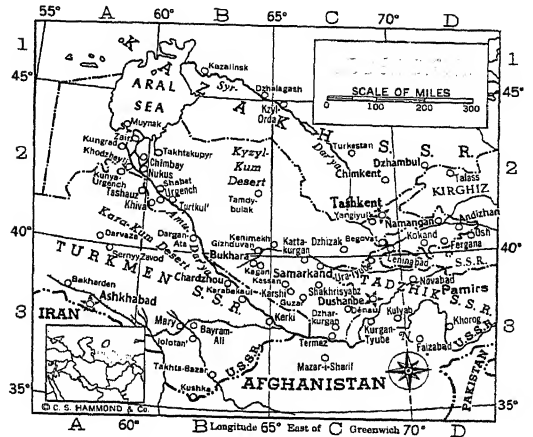
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Union, bounded on the N. and N.E. by the Kazakh S.S.R., on the E. and S.E. by the Kirghiz S.S.R. and the Tadjik S.S.R. consecutively, on the S. by Afghanistan, and on the W. by the Turkmen S.S.R. It includes within its boundaries the Kara-Kalpak A.S.S.R. The remainder of the republic is divided administratively into ten oblasts. Tashkent is the capital, and other important cities are Andizhan, Bukhara, Samarkand (qq.v.), and Kokand.

The Uzbek S.S.R. forms part of the immense

plain which stretches from the Amu-Dar'ya R. in the W. to the Tien Shan, Pamir, and Altay mountains in the E. Extreme temperatures occur in summer and winter. Rainfall is insufficient, and much of the cultivated area is irrigated with water from the principal rivers, notably the

Women doing traditional embroidery in a Bukhara factory. The famous Bukhara rugs are also made by hand, with women doing most of the embroidery. UPI



UZBEK SOVIET SOCIALIST REPUBLIC

The oriental features of this Uzbek canal worker reflect the racial lineage of the people in the steppe region.

UPI



Amu-Dar'ya and Syr-Dar'ya. In order to stop the encroachments on cultivable lands of sands from the Kyzyl-Kum Desert in the n.w., more than 125,000 acres of forest belts have been planted on the edges of certain oases and in the desert itself.

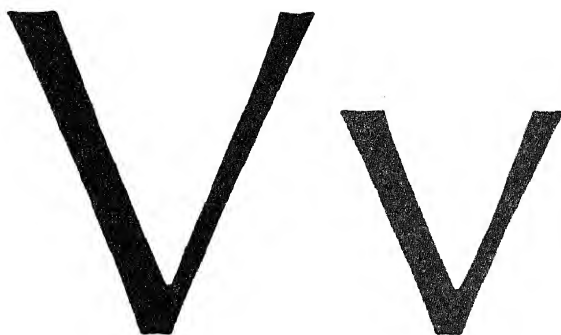
A network of irrigation has made the Uzbek S.S.R. the main cotton-producing area in the Soviet Union. Other crops are rice, cereals, alfalfa, and a variety of fruits. Oil, natural gas, coal, copper, sulfur, ozocerite, tungsten, salt, and marble are mined. Power for manufacturing is supplied by hydroelectric power stations situated on the rivers, and the chief industries include oil refining, food processing, and the manufacture of textiles, farm machinery, iron and steel, and chemicals.

Educational facilities include two universities and 30 institutes of higher learning, with a total attendance of 204,700 students. An academy of

sciences and 150 scientific research establishments are also in the republic. About 62 percent of the people are Uzbeks, of the Sunni Muslim sect (see ISLAM). The rest are Russians, Tatars, Kazakhs, Tazhiks, and Kara-Kalpaks. The Uzbeks are a Turkic people who inhabited Mongolia until the 13th century, at which time they were driven into Turkestan (q.v.), in Central Asia, by the Mongols. They probably received the name Uzbeks during the 14th century, when they were ruled by Uzbek, or Uzbeg, Khan, a Mongol chief of the Golden Horde (q.v.).

On December 5, 1924, the Uzbek S.S.R. was created from territory included in the former Turkestan Autonomous Soviet Socialist Republic and the former Khiva and Bokhara people's republics. Uzbekistan became a constituent republic of the U.S.S.R. in the following year. Area, 173,590 sq.mi.; pop. (1970) 11,963,000.

UZNAM. See USEDOM.



V, twenty-second letter and seventeenth consonant of the English alphabet. The form of the capital letter first appeared in Latin, in which it was adapted from a western or Chalcidian form of the Greek letter *upsilon*. This in turn was derived from a Phoenician letter corresponding to the Hebrew *vau*, which was based upon earlier Egyptian hieratic and hieroglyphic characters. The stages through which the form of capital V evolved may be summarized as follows:



In English, the letters u and v were used interchangeably until the 15th to 17th centuries, in some instances even later. The u was generally employed as the cursive form.

The sound of v is technically known as a voiced labiodental spirant. Its corresponding voiceless character is f. The v sound is produced by pressing the lower lip against the upper teeth and expelling the breath through the mouth while vibrating the vocal cords. In Latin, v was first used as a vowel interchangeable with u, and later as a consonant; its original consonantal value corresponded to that of the English letter w, and its value after about the 4th century A.D. corresponded to its present English sound. The Latin sound had changed from that of English w to that of English v by the time of the Germanic invasions of the Roman Empire. The new w sound brought in by the invaders did not merge generally with the Latin v, but was retained in Romance languages (q.v.) as a w sound with a prefixed g; for example, the Germanic word *wardan* became in Italian *guardare*; in Spanish, *guardar*; and in Old French, *garder* (later *garden*). The Greek letter *upsilon*, from

which the Latin v was derived, was used as a vowel, but the Phoenician and the Hebrew character *vau* had a consonantal value only. The use of v as the initial letter of an English word usually indicates that the word has been derived from Latin or French rather than from Anglo-Saxon.

The capital letter V in chemistry is the symbol for the element vanadium; in mathematics it stands for vector. Either the capital or lowercase V may be used as a symbol for electric potential, velocity, and volume. The lowercase v is the abbreviation for such words as valve, verb, verse, *versus* (Lat., "against"), *vide* (Lat., "see"), village, violin, and vision. In German names, v stands for *von* ("from"). In Roman numerals V denotes the number 5; in the form \bar{V} it denotes 5000. This usage of the letter is derived from the use of X for the number 10; V is the upper half of X and therefore symbolizes one half its value. The capital letter is used as a qualifying noun in compound words to denote something shaped like the letter, as a V neckline or a V-type engine. In World War II the Allied nations used the capital V as the symbol of victory.

M.P.
VAAL, river of South Africa, rising in the Drakensberg mountains, on the border of Swaziland, and flowing w. and s.w. along the n. border of the Orange Free State to its junction, after a course of some 500 mi., with the Orange R.

VACAVILLE, city of California, in Solano Co., about 29 miles s.w. of Sacramento. Primarily a processing and marketing center for the surrounding area where plums and cherries are grown, the city has some manufacturing. Founded in 1850, Vacaville was incorporated in 1892. Pop. (1960) 10,898; (1970) 21,690.

VACCINATION, in the original sense, the process of protective inoculation against smallpox (q.v.), or variola, by introduction of the virus of vaccinia or cowpox (q.v.), through an abrasion in the skin. In its broadest sense, vacci-

VACCINATION

nation is inoculation with the dead or modified form of a pathogenic organism to induce a mild attack of the disease it produces, and thus to effect immunity to subsequent natural attacks of those pathogenic organisms. Vaccinia is the bovine form of variola, which is less virulent in human beings. When contracted by a human being, cowpox produces an immunity to smallpox.

The immunity to smallpox of milkmaids and other persons who had contracted cowpox, through working with cows, was known as early as the 17th century. To test this observation, the British physician Edward Jenner (q.v.) conducted an experiment in 1796, inoculating a boy with pus taken from a cowpox lesion, and no disease developed. The results of this experiment, demonstrating scientifically how immunity to smallpox might be acquired, were published by Jenner in 1798 and led eventually to the acceptance of vaccination, which has since reduced smallpox as an epidemic disease.

The success of vaccination in smallpox prevention has led many nations of the world to make vaccination compulsory. In the United States the laws regarding compulsory vaccination vary from State to State, but even in States having laws which do not specifically require vaccination, the State or municipal boards of

health, cooperating in some instances with school authorities, have formulated regulations under which vaccination is made almost compulsory by placing great restrictions on the educational and social activities in which nonvaccinated children may participate. Vaccination provides and maintains active immunity to smallpox for at least five years.

For vaccines developed to combat other diseases such as poliomyelitis, typhus, and yellow fever (qq.v.), see IMMUNITY.

See also VIRUS.

VACUUM, defined strictly, space absolutely devoid of matter of any kind. In practical physics, however, vacuum is the condition in a space or an enclosure in which the pressure (q.v.) of the residual gas such as air is less than that of the normal atmosphere (q.v.) surrounding it. Regardless of pressure or vacuum conditions, gas molecules, free or enclosed, are in constant motion; see MOLECULE. Those molecules inside an enclosure strike the walls and rebound, resulting in a push or force on the wall. The average force these molecules exert on a unit area of wall is called pressure. At normal atmospheric conditions at sea level, this pressure has the force to support a 760-mm mercury (abbreviated mm Hg) column. If the number of molecules that provides this force is reduced, the pressure is lowered correspondingly in proportion to the force the remaining molecules can exert. The degrees of vacuum and their pressure ranges follow.

Mass vaccination of children against measles. Such emergency programs cover several thousand youngsters a day in an effort to prevent the outbreak of an epidemic.

Wide World



Low vacuum	760 mm (normal) to 25 mm Hg
Medium vacuum	25 mm to 10^{-3} mm Hg
High vacuum	10^{-3} mm to 10^{-6} mm Hg
Very high vacuum	10^{-6} mm to 10^{-9} mm Hg
Ultra high vacuum	10^{-9} mm Hg and lower

A newer unit for subatmospheric pressure is the torr, named after the Italian mathematician and physicist Evangelista Torricelli (q.v.), which equals 1 mm Hg. Normal atmospheric pressure decreases with increasing altitude; at an altitude of 9 mi., the air pressure drops from 760 mm to 100 mm Hg; at 500 mi., it drops to about 1×10^{-9} mm Hg. Gas molecules in constant motion also collide with each other and the distance they travel before a collision occurs is only 6.69×10^{-9} cm at 760 mm Hg. As pressure decreases their freedom increases and thus at 500 mi. altitude they travel a statistical average of 5.09^6 cm before a collision occurs. This free distance, before collision occurs, is called mean free path, a concept that is of considerable practical importance in defining the behavior of a gas in a vacuum. Pressures of 10^{-15} mm Hg and lower have been attained in the laboratory, approaching the pressure in interstellar space. See also KINETIC THEORY; VACUUM TECHNOLOGY. E.S.Ba.

VACUUM BOTTLE, or **VACUUM FLASK**, cylindrical container, usually made of two glass walls with a near-vacuum in between; see **VACUUM**. The bottle is used in the home and in scientific and industrial research to maintain liquids, and sometimes solids, at near-constant temperatures. An efficient flask can keep its contents at the desired hot or cold temperature for as long as three days; see **TEMPERATURE**. This is achieved by preventing heat transfer from inside the bottle to the atmosphere and vice versa; see **HEAT TRANSFER**. Glass is used for the walls because it is a poor conductor of heat and its surfaces are usually lined with reflective aluminum to prevent the transfer of heat by radiation (q.v.). The near-vacuum conditions between the container walls preclude heat transfer by convection (q.v.). The whole fragile flask rests on a shock-absorbing spring (q.v.) within a metal or plastic container, and the air between the flask and the container provides further insulation (q.v.).

The vacuum bottle was invented in 1892 by the British chemist James Dewar (q.v.), who designed it originally for the storage of liquid gases. The first Dewar flasks were called Thermos flasks.

VACUUM CLEANER or **VACUUM SWEEPER**, electrical appliance in common use for cleaning furniture, floors, rugs, and carpets by suction; see **ELECTRIC HOME APPLIANCES**. Generally, vacuum cleaners are of two types, the vertical type, which is light and moves over the surfaces to be

cleaned, and the canister, or tank type, which remains stationary or moves over a cushion of air, and has a long hose with a nozzle that can be moved over the area to be cleaned. An electric motor inside the appliance turns a fan which creates a partial vacuum and causes outside air to rush into the evacuated space. This forces any dirt or dust in the way into a bag inside the machine or attached to the outside.

Most vacuum cleaners have a variety of attachments that can be used to clean different types of surfaces such as window sills and thick rugs and carpets, and some are also equipped to polish floors and shampoo rugs. A reversible motor on many appliances is used to blow dirt out of difficult and inaccessible surfaces, and also to spray paint.

VACUUM TECHNOLOGY, in physics and engineering (qq.v.), processes and equipment based on the principle that when the quantity of oppressive gas such as air in a closed vessel is removed, the remaining molecules, atoms, or any electrically charged particles derived from them, such as ions and electrons, can move about more freely; see **VACUUM**. This freedom is proportional to the reduction in the gas pressure; see **ATOM AND ATOMIC THEORY**; **ELECTRON**; **ION**; **MOLECULE**; **PRESSURE**.

Development. Low and medium vacuums have been in common use in such household equipment as vacuum bottles and vacuum cleaners since the late 19th century; see **VACUUM BOTTLE**; **VACUUM CLEANER**. The distillation (q.v.) of lubricating oils from petroleum residues and the removal of atmospheric oxygen from electric light bulbs also employ vacuum technology. Before World War II, however, high-vacuum techniques, achieving near-complete vacuum conditions, were mainly used in research laboratories, the one exception being radio-tube production; see **VACUUM TUBES**, **THERMIONIC**. During the war techniques for coating optical lenses with extremely thin films of magnesium fluoride using high vacuum, became established. This process improved the optical quality of the lenses by reducing light reflection; see **LENS**; **OPTICS**; *Geometrical Optics: Reflection and Refraction*. High-vacuum techniques are also employed in the molecular distillation of fish oils to produce vitamin A concentrate, and in the electromagnetic separation of uranium-235 from nonradioactive uranium (q.v.) with which it is associated in nature; see **ELECTROMAGNETISM**; **ISOTOPE: Separation**; **RADIOACTIVITY**.

Uses. One of the more important recent applications of vacuum technology is in large-scale industrial refrigeration (q.v.). The rate of evapo-

ration of water is accelerated in vacuum conditions and the process is used for freeze-drying foods; see **FOOD PRESERVATION: Freezing**. The water in the food is removed by sublimation into ice which, at the same time, freezes the food. Metal evaporation in high vacuum is used to coat plastics (q.v.) and other objects to give them a high, metallic luster. This process was an outgrowth of the lens-coating process. Television-tube production rate was greatly accelerated by the introduction of high-speed, high-vacuum pumps. High-vacuum treatment of melted, cast, or sintered metals improves their physical properties by removing gases and other impurities. Single-metal crystals used in transistors and similar electronic devices are "grown", or prepared, in high-vacuum furnaces; see **CRYSTAL; FURNACE; TRANSISTOR**. Electrical transformers and high-voltage cables are vacuum impregnated with high dielectric (q.v.) material to improve the insulation (q.v.). To get maximum insulation from heat for flasks and pipes that store and transport liquid oxygen, nitrogen, and helium, the container walls are maintained at high vacuum. Substrates, or bases, used in making electronic microcircuits are prepared by sputter-coating them with refractory materials such as tantalum and tungsten under high-vacuum conditions; see **INTEGRATED CIRCUIT**. Vacuum plays a very important part in scientific and technological research. Atomic particle accelerators depend on high and very high vacuum to provide a relatively gas-free unobstructed path for the ionized particles to travel; see **ACCELERATORS, PARTICLE; IONIZATION**. Large chambers of up to thousands of cubic-feet capacity, and requiring great pumping speeds for gas removal, are used to test aerospace equipment in simulated outer-space conditions. In certain types of analyses, if the material to be analyzed must be in a gaseous state or in the form of electrically charged ions (see **ION**), then vacuum must be used to produce these requirements. The mass spectroscopy, electron microscope, and vacuum-fusion and nuclear magnetic resonance analyzers are but a few such instruments; see **CHEMISTRY: Analytical Chemistry; MICROSCOPE: Electron Microscope; SPECTRUM: Spectroscopes**. New uses for the unique capabilities of vacuum operation are continually being discovered.

Nature of Equipment. An operational vacuum system is made up, in general, of three parts, the chamber in which the work is done, the vacuum pumps, and the accessory equipment such as electrical controls and piping. A simple vacuum system is shown in Fig. 1. To make the equipment operable, the work chamber with its vac-

uum gauge is sealed vacuum tight to the pumping port. After closing the high-vacuum and roughing valves and opening the forepressure valve, both the diffusion and mechanical pumps are started. When the diffusion pump is operating, it is isolated from the rest of the system by closing the forepressure valve. The work chamber is then pumped out, first by the mechanical pump. To do this, the air inlet valve is closed and the roughing valve opened. When the pressure in the work chamber has been lowered to around 1×10^{-1} mm Hg, the chamber is opened to the diffusion pump by first closing the roughing valve and then opening the forepressure and the high-vacuum valves. The work chamber is then ready to carry out its high-vacuum operation. The work chamber is an airtight container with one or more places of access to the interior. A gasketed glass or steel bell jar is often used as the work chamber for simple operations. Leak-tight connections to the chamber are provided for accessories such as sight glasses, devices that transfer mechanical motion into the vacuum, and electrical terminals.

An early type of vacuum pump resembled the reciprocating steam engine; see **PUMPS AND PUMPING MACHINERY**. This pump has been replaced in vacuum work today by the rotary oil-seal pump (Fig. 2) and the ejector pump (Fig. 3). In the rotary pump, an eccentric cylinder rotates within a hollow cylindrical casing. A reciprocating vane mounted in the casing and maintained in contact with the rotor provides a seal between inlet and outlet ports. The entire interior is flooded with a low vapor-pressure sealing oil. Ejector pumps operate on the principle that a liquid or gas under pressure, when released through a nozzle, sometimes called a jet, in a directed stream, will pick up gas molecules in a mixing chamber and eject them, thus producing a vacuum. If water is the moving force, the vacuum device is called an aspirator or barometric condenser; if steam is the mover, it is called a steam ejector. The diffusion pump (Fig. 4) operates on a similar principle, but uses the boiled-off vapor of a very low vapor-pressure liquid, such as a specially chosen and prepared organic fluid, or mercury, as the moving medium. The boiled-off vapors are recycled by continually condensing and reboiling the returned condensate. A few of the many other types of vacuum pumps include ion pumps (used when a dry, vapor-free condition is essential), operating by ionizing the gas molecules and trapping them on electrically charged collector plates; chemical-ion pumps, which rely on the reaction of vapors of a metal such as titanium with the gas

Fig. 1 Simple Vacuum System

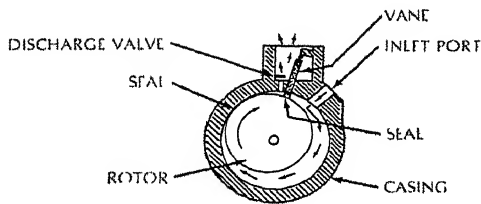
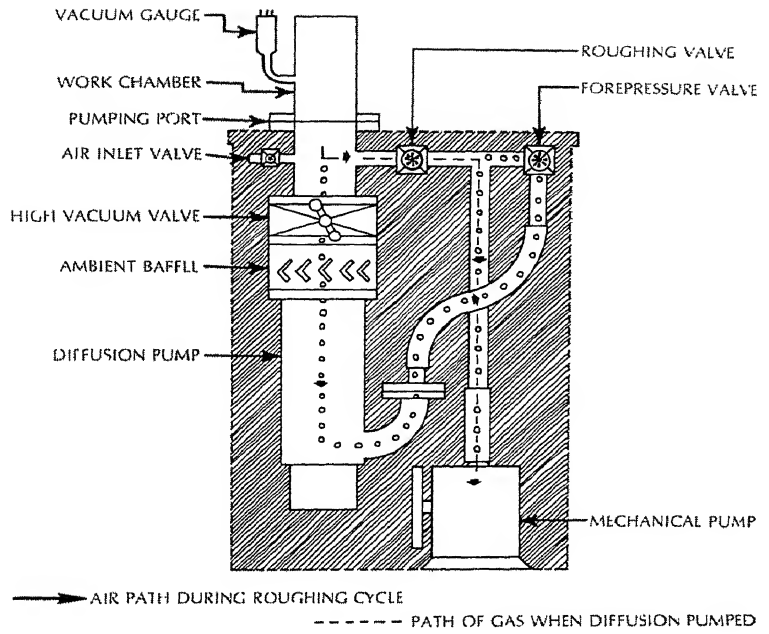


Fig. 2 Rotary Oil-Seal Vacuum Pump

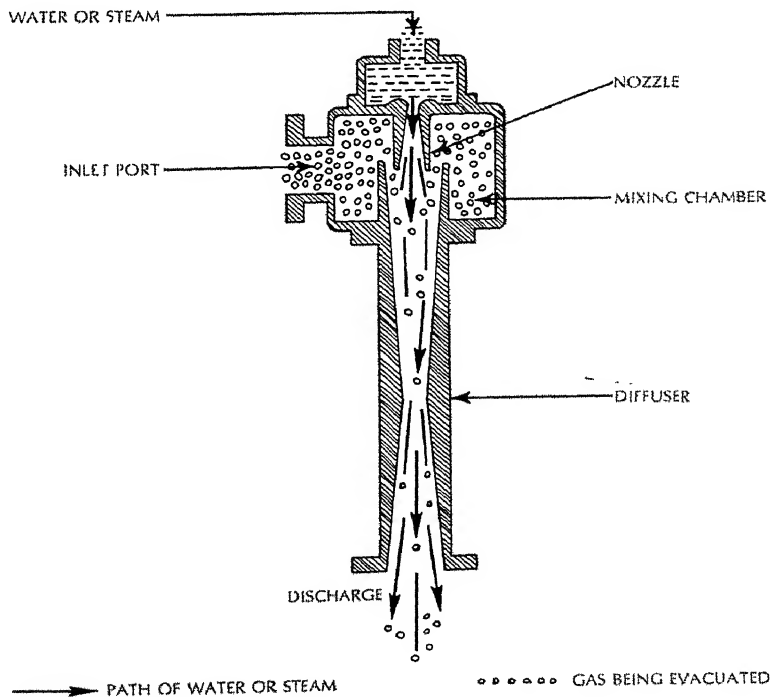


Fig. 3 Ejector Pump

VACUUM TECHNOLOGY

which is then condensed on the walls of the pump casing, and sorption pumps, which remove gases by adsorbing and absorbing them, using artificial zeolite, better known as the molecular sieve. Cryogenic pumping is accomplished by condensing out the gases on surfaces maintained at extremely low temperatures; see CRYOGENICS

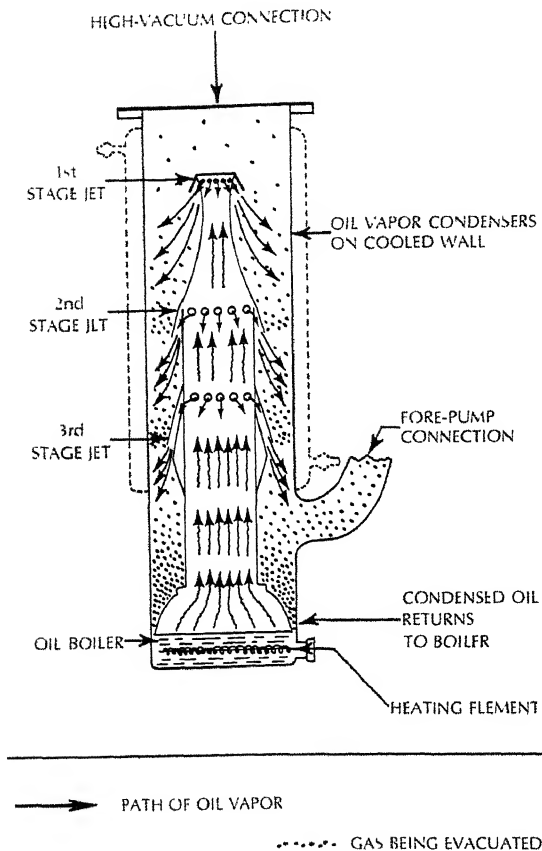


Fig. 4 Diffusion Pump

Measurement of Vacuum. Devices used to measure vacuum conditions are called gauges, and all vacuum is measured as absolute pressure, because all degrees of it are above hypothetical, unattainable "zero" pressure. The mercury manometer measures pressures from atmospheric (760 mm Hg) down to 1 mm Hg and its variant, the McLeod gauge, extends its range down to 10^{-6} mm Hg; see PRESSURE. Two mechanical gauges cover the same range as the mercury manometer, one operating by Bourdon

tube, the other by a diaphragm. These are sometimes calibrated as "gauge" vacuum instead of absolute pressure. Medium vacuum is measured by thermocouple and Pirani gauges. These operate on the principle that the thermal conductivity of gas is proportional to the number of residual gas molecules, in other words, the pressure. Their range is from 10^{-3} mm to 1 mm Hg. The radioactive ionization gauge responds between 10^{-3} mm and 760 mm Hg. High and very high vacuums are measured by the electrical charge carried by a gas ionized by electron bombardment. Two gauges that use this principle are the thermionic, or hot-cathode, type and the glow, or cold-cathode discharge, type. The former covers a 10^{-3} mm to 10^{-10} mm Hg range, the latter 10^{-3} mm to 10^{-8} mm Hg range. As a vacuum gets into the ultra high range, its measurement becomes increasingly difficult. Pressures of 10^{-12} mm Hg and less are measured by specially designed mass spectrometer analyzer techniques. All gauges that depend on thermal conductivity or ionized gas for measurement respond differently to different gases, and hence they are usually calibrated against dry air, using the McLeod gauge as a reference.

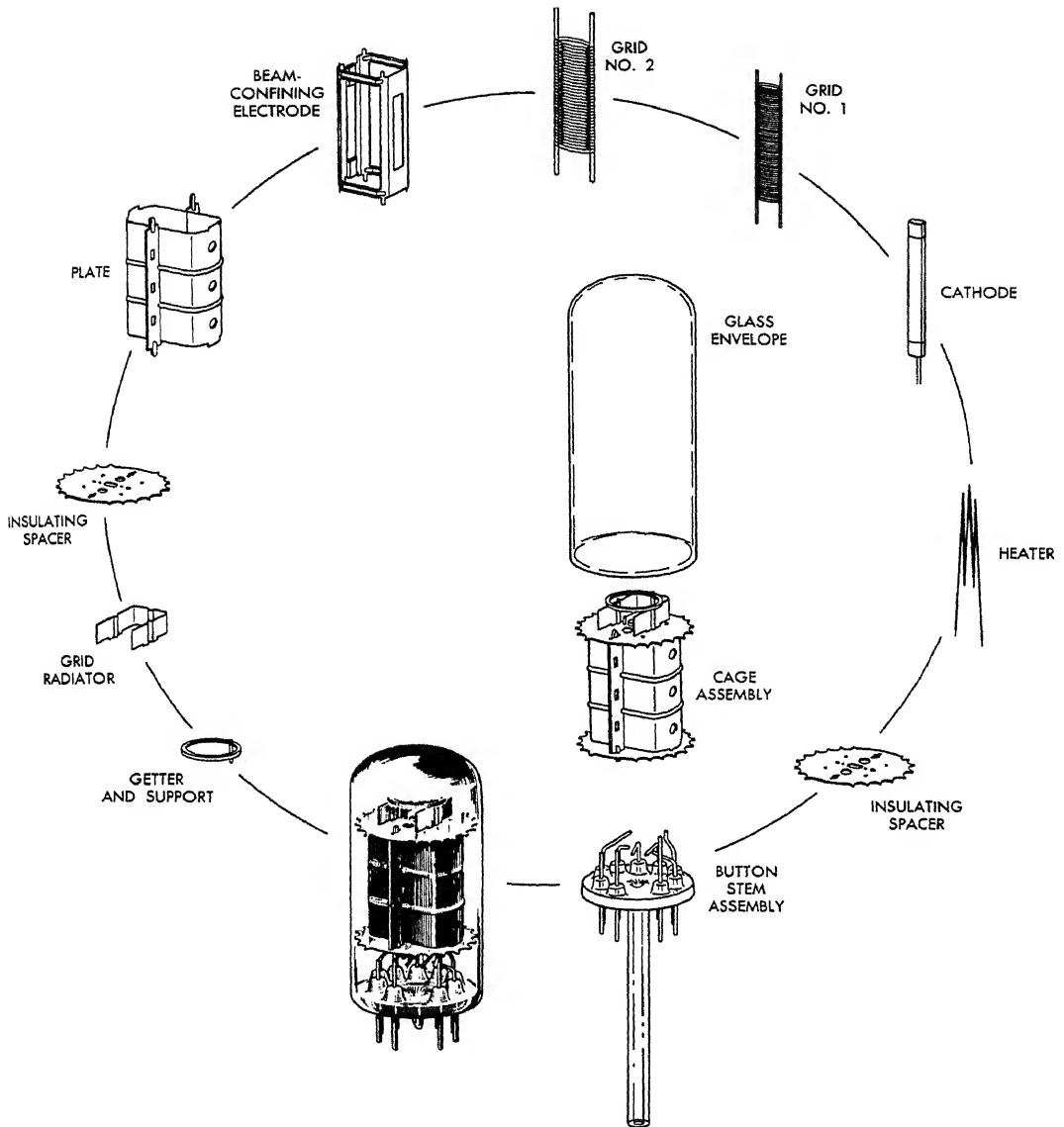
Pumps, valves, operating sequences, and protective interlocks for the operation occurring in the work chamber are controlled by electrical components located in a control center on or near the machine. The controls can be manual or computerized. Baffles and traps are often used in the vacuum pipes to check the movement of unwanted gas molecules from the pumps to the work chamber, or the reverse. The baffles operate either at local temperature or are chilled to dry ice or liquid nitrogen temperature, condensing or adsorbing the molecules on the baffle surfaces. Other accessories that make up the vacuum system are valves, piping and pipe connection, designed to operate with no leakage from outside.

Compare AIR COMPRESSOR.

VACUUM TUBES, THERMIONIC, partially evacuated electron tubes containing two or more electrodes, one of which is a heated cathode serving as the electron source; see ELECTRODE; ELECTRON. The development of vacuum tubes in the early 20th century made possible the modern era of electronics (q.v.), including communications, control, and computer systems. See AUTOMATION; CATHODE RAYS; COMPUTER; RADAR, RADIO; TELEVISION.

Vacuum tubes called diodes contain only two electrodes, the electron-emitting cathode and the electron-collecting element, called the anode, or plate. In diodes the electrons emitted by the cathode are attracted to the plate only

VACUUM TUBES, THERMIONIC



The major parts of a typical vacuum tube include the glass envelope, the cage assembly, and the button stem assembly. In assembling these elements to form a completed tube, the connections in the cage assembly are first welded to the corresponding connections in the button stem assembly; then the glass envelope is sealed to the button stem assembly and the tube is evacuated through the long glass tubulation extruding from the bottom. Finally, the tubulation is cut off and sealed at the base. The elements in the outer circle, except for the button stem and the completed tube, are carefully fitted together to form the cage assembly. The parts illustrated comprise a beam power tube or pentode.

when the latter is positive with respect to the cathode. When the plate is negatively charged no current flows through the tube. If an alternating potential is applied to the plate the tube

passes current only during the positive halves of the cycle and thus acts as a rectifier. Diodes are used extensively in the rectification of alternating current; see *ELECTRICITY: Current Electricity*.

The introduction of a third electrode, called a grid, interposed between the cathode and the anode, forms the triode, which is the basic tube used for amplifying current. The function of the grid is to control the current flow. The grid usually consists of a network of fine wire surrounding the cathode. The capacity of the grid to control the current flow depends on the fact that small changes in the voltage between the grid and the cathode cause large changes in the number of electrons reaching the anode.

VACUUM TUBES, THERMIONIC

More complex tubes with additional grids are constructed to provide greater amplification or to perform specialized functions in radio, television, and other electronic equipment. For the operating principles of various types of vacuum tubes, see **ELECTRONICS**. The general structural features of such tubes are described below.

Construction. The cathode in a thermionic vacuum tube may consist of an electron-emitting filament, heated directly by an electric current, or of a thin metal cylinder coated with emissive material which is heated indirectly by an insulation-coated heater located inside the cylinder. The emissive material coating the cathode cylinder surface usually is a layer of barium and strontium (qq.v.) oxides, which provides copious electron emission at operating temperatures of about 650° C. (1200° F.). Such a coating is obtained by applying these substances to the cathode surface in the form of carbonates suspended in an organic binder. In the process of evacuation the carbonates are converted into oxides by heating, which also disintegrates the organic binder.

Mounting. In small vacuum tubes used in radio and television receivers, the active components, including the cathode, grid, anode, and (if the cathode is indirectly heated) the heater unit, are welded to wires and arranged in an assembly in fixed relation to each other by means of mica spacers or other insulators. This assembly is heat-sealed to an envelope which usually is made of glass but may also be made out of metal.

Evacuation. After the air pressure within the tube has been reduced by vacuum pumps to less than a ten millionth of atmospheric pressure, the tube may be baked for a prolonged period at temperatures averaging about 400° C. (750° F.), depending on the envelope material, in order to remove gases occluded in the tube envelope and in its other components. For further purification, the metal parts are heated to a dull red heat by radio-frequency heating. During this process the cathode is activated, and a so-called getter deposit, consisting of a mixture of highly reactive metals, such as barium, tantalum, and aluminum, is formed by evaporation within the tube, before it is sealed off from the vacuum pumps. The getter serves to maintain the vacuum at a high level by absorbing gas evolved during the sealing-off period and subsequently during the life of the tube.

Insulation. The final step in the manufacture of a glass tube is fitting it with an insulating plastic base equipped with hollow prongs into which the leads are soldered. In some tubes no

bases are used and the circuit connections to the tubes are made directly to the tube leads.

Cooling Units. The construction of large tubes used for radio transmission and power rectification purposes is modified by the necessity of dissipating large quantities of heat generated by the tube when in operation. Water cooling commonly is provided for the plates and grids of high-power tubes. Smaller power tubes usually have elements that are mechanically constructed to radiate heat efficiently to the outside walls, which are cooled by the natural circulation of air or by a forced draft of air from a blower.

In many electronic applications today, especially in small portable radios, television, hi-fi and sound-recording equipment, and in all computers, vacuum tubes have been largely replaced by transistors, which are smaller, more reliable, have a longer lifetime, and use less power. The use of the vacuum tube is primarily limited to applications where a large amount of power is required. See **HIGH FIDELITY**; **PHONOGRAPH**; **SOUND RECORDING**; **TRANSISTOR**. V.K.Z.

VADUZ, town and capital of the principality of Liechtenstein, situated near the right bank of the Rhine R., at an elevation of 1525 ft. The town has a Gothic parish church and a castle, which, destroyed by the Swiss in 1499, was rebuilt from 1523 and 1526, and which is the residence of the ruling prince. The tower of the castle dates from the 9th century. Pop. (1970 est.) 3921.

VALDAY HILLS, low plateau or group of hills in the w. central section of the Russian S.F.S.R. The hills rise very gradually from the surrounding plain and are dissected by numerous narrow valleys containing a number of lakes. The maximum elevation of the hills is about 1140 ft. above sea level. They were formerly forested, but are now mostly cleared and cultivated. In the plateau rise the Volga R. and its branches.

VALDIVIA, city in Chile, and capital of Valdivia Province, near the mouth of the Valdivia R., 10 miles E. of the outport of Corral on the Pacific Ocean, about 450 miles S.W. of Santiago. The city lies in an area of forests, apple orchards, and livestock breeding. Industries include food processing, paper milling, brewing, flour milling, and the manufacture of metallurgical goods, lumber, leather, and wood products. Seaside resorts lie nearby, and the city is a point of entry to the lake-district resorts to the E. The Universidad Austral de Chile was established here in 1954. Founded by Pedro de Valdivia, a lieutenant of the Spanish explorer Francisco Pizarro (qq.v.), in 1552, Valdivia has a large German colony that arrived in the 1850's. It was the

site, in 1818, of a Chilean victory in the wars of independence. Pop. (1970 prelim.) 90,942.

VALDIVIA, Pedro de (about 1500–54), Spanish military leader and conqueror of Chile, born in Villanueva de la Serena. In 1535 he played an important role in the conquest of Venezuela, and in 1537 he served in Peru with the Spanish conquistador Francisco Pizarro (q.v.). Pizarro then authorized Valdivia to conquer and colonize Chile. Valdivia left Peru in 1540 with about 175 Spanish soldiers and a contingent of Indians, made the difficult march across the Atacama Desert, and, early in 1541, founded Santiago. Hostile Araucanian (q.v.) Indians nearly demolished the settlement in 1543, but reinforcements arrived in time to save it. The following year Valdivia established La Serena, north of Santiago. Returning to Peru in 1547, he helped quell the rebellion led by Francisco Pizarro's brother Gonzalo Pizarro (1506?–48). Valdivia was named governor of Chile the following year and subsequently founded a number of settlements in central and southern Chile, notably Concepción (1550) and Valdivia (1552). The Araucanian Indians killed him on Jan. 1, 1554, during an uprising. See CHILE: History.

VALDOSTA, city in Georgia, and county seat of Lowndes Co., about 135 miles S.E. of Macon. Valdosta is a railroad center, an important turpentine and resin market, and the trading center and shipping point of a lumbering and agricultural area. Among the major industrial products are pulp and paper, textiles, and metal and wood products. Valdosta State College, established in 1906, is in the city. Valdosta was settled in 1859 and chartered as a city in 1901. Pop. (1960) 30,652; (1970) 32,303.

VALENCE, in chemistry, a number representing the capacity of a single atom of any element to combine with atoms of other elements. The concept of valence has also been extended to include radicals, or groups of atoms, and even compounds.

Each water molecule, for example, contains two atoms of hydrogen and one of oxygen. Hydrogen, by definition, has a valence of + 1, and the oxygen atom, neutralizing the effects of two hydrogen atoms, has a valence of – 2; an ammonia molecule contains three atoms of hydrogen and one of nitrogen, and so nitrogen has a valence of – 3. These concepts are discussed in detail, and their theoretical explanation is presented, in the articles ATOM AND ATOMIC THEORY; CHEMISTRY.

All of the elements in the first column of the periodic table of the elements (see PERIODIC

Law) have valences of + 1; all of the elements in the seventh column have valences of – 1. Elements in the second and sixth columns usually have valences of + 2 and – 2, respectively, but a number of the elements in the sixth column have valences of + 6. Similar rules apply to elements in the third, fourth, and fifth columns. Thus carbon, in the fourth column, has a valence of – 4 in the compound methane (CH_4) and a valence of + 4 in the compound carbon tetrachloride (CCl_4). The positive and negative valences of carbon, however, are not clearly distinguishable. In the compound chloroform (CHCl_3), carbon has its valence of four, since it combines with four monovalent atoms, but the valence is part negative and part positive.

Electrovalence and Covalence. A compound between a highly electropositive element (that is, one that has a strong tendency toward positive valence, such as sodium) and a highly electronegative element, such as chlorine, is formed by the transfer of an electron from the former to the latter. The binding between the ions thus formed is called electrovalent. Compounds between carbon and most other atoms, in which the valency does not seem to be either positive or negative, are formed by chemical bonds which are covalent. The covalent bond is formed by the mutual sharing of electrons by two atoms. Covalent and electrovalent compounds, however, are not always clearly distinguishable. In ammonia, for example, the electrons donated by the three hydrogen atoms form pairs with three of the five nitrogen electrons. These pairs are then partially shared with the hydrogen atoms, but the attachment to the nitrogen atom is slightly stronger. The resulting chemical bonds are intermediate in nature between electrovalent and covalent. The remaining two electrons on the nitrogen atom can still be shared, forming another type of chemical bond called a coordinate bond. Thus, four ammonia molecules may attach themselves to a copper ion, forming the familiar cupric-ammonia complex, with a characteristic brilliant blue color. Or an ammonia molecule may attach itself to a hydrogen ion, forming the familiar ammonium ion (NH_4^+). This example indicates that the coordinate bond is not essentially different from the ordinary covalent bond, inasmuch as the four hydrogen atoms in this ion are indistinguishable. Numerous other compounds are known in which nitrogen shows a coordinate valence of four. The coordinate valence of an element may have little apparent relation to its ordinary valence. Thus iron (q.v.) has an electrovalence of + 2 or + 3, and simultaneously

VALENCIA

has a coordinate valence of + 6, as in the ferrocyanides and ferricyanides.

Recent Developments. Much has now been learned concerning the theoretical nature of valence, particularly through the work of the American chemists Gilbert Newton Lewis, Irving Langmuir, and Linus Pauling (qq.v.). Further understanding of the nature of chemical bonding has been derived from the application of quantum theory (q.v.). Physicists have developed these ideas further, in particular, the Swiss physicist Walter Heinrich Heitler (1904–), and the American physicists Robert Sanderson Mulliken (1896–) and John Clarke Slater (1900–). Electrons, according to the quantum theory, are restricted in their movements within a molecule, the allowed movement or distribution of an electron being known as an orbital. If an orbital allows an electron to spend much of its time in the region between two atoms, its effect will be to bind the two atoms together, and the orbital is said to be a bonding orbital; other orbitals are classified as either non-bonding or anti-bonding. The number of electrons in the three types of orbitals determines whether a molecule will stay together, that is, whether or not it will be stable.

Some valency phenomena remain incompletely explained. The intermetallic compounds (see ALLOY) obey valency rules that are entirely different from those obeyed by the same metals in ordinary compounds. An outstanding problem among simple compounds is exhibited by the boron hydrides. The study of valency is essentially the study of the chemical bond. Since all chemical action depends on it, is a basic problem of the science of chemistry. S.Z.L.

VALENCIA, former kingdom of Spain, comprising the present provinces of Valencia, Alicante, and Castellón de la Plana. Upon the dissolution of the caliphate of Córdoba in the early 11th century, Valencia became an independent kingdom; see CALIPH: *The Fatimid Dynasty and the Umayyads of Spain*. Toward the close of the century it passed under the rule of the Almoravids (q.v.), who were supplanted three years later (1095) by the Spanish hero the Cid (q.v.), whose death (1095) soon forced his widow again to give way to the Moors (q.v.). In 1238 the city of Valencia was taken by James I (q.v.), King of Aragón, who soon became master of the region. Although ruled by the kings of Aragón, Valencia remained autonomous until 1319, when it was united with Aragón.

VALENCIA (anc. *Valentia*), city in Spain, and capital of Valencia Province, 2 miles w. of Villanueva del Grao, its port on the Mediterranean

Sea, on a fertile plain near the mouth of the Turia R., about 190 miles s.e. of Madrid. It is the third-largest city of Spain and a center for agricultural marketing, manufacturing, and communications. Industrial establishments in the city include textile mills, chemical works, metalworks, shipyards, and breweries.

Valencia is the seat of an archbishopric. It has a university (founded in 1500), a museum of fine arts (1753), and a school of fine arts (1756). Two gates remain from 14th-century walls built on Roman foundations. Among noteworthy buildings in Valencia are the Gothic cathedral (13th–15th centuries) and the Gothic silk exchange (15th century).

History. According to the Roman historian Livy (q.v.), Roman soldiers occupied the site of Valencia in 138 B.C. Pompey the Great (see under POMPEIUS) partly destroyed the city in 75 B.C. during his campaign against the armies of the rebel leader Quintus Sertorius (q.v.). Valencia remained under Rome until 413 A.D., when it was captured by the Visigoths (see GOTHs: *Visigoths*). The Moors (q.v.) took it from the Visigoths in 714 and in 1021 made it the capital of the independent kingdom of Valencia (q.v.). Thereafter Valencia shared the fortunes of the kingdom. The city had a high level of culture and prosperity until early in the 17th century, when a commercial decline set in because of the expulsion of Moorish traders. In 1812–13, during the Napoleonic Wars (q.v.), Valencia was held by the French. It was the capital of the republican government for a time during the Spanish Civil War (1936–39). Pop. (1970 prelim.) 648,000.

VALENCIA, city in Venezuela, and capital of Carabobo State, near Lake Valencia, about 75 miles s.w. of Caracas. It is in the principal agricultural region of the country, and is also a leading manufacturing center. Among the industrial activities are sugar refining, meat-packing, tanning, and the manufacturing of cotton textiles. In the city is the University of Carabobo. Valencia was founded by the Spanish in 1555, and served briefly as the national capital several times during the 19th century. Pop. (greater city; 1970 est.) 224,800.

VALENS (about 328–78), Roman Emperor of the East (364–78), born in Cibalae (near modern Osijek, Yugoslavia). He was chosen by his brother Valentinian I, Roman Emperor of the West (see under VALENTINIAN), as his coregent in the East. In 367 Valens went to war against the Visigoths; see GOTHs: *Visigoths*. Two years later he agreed to peace; the Danube R. was to be the new border between the Visigoths and the Romans. Va-

lens stayed in Asia Minor between 371 and 377, concerning himself with the Persian threat to Armenia. In 376 he granted the Visigoths permission to cross the Danube. Alleging a breach of good faith on the part of the Romans, the Goths attacked and plundered. In 378 Valens and most of the Roman army perished at the hands of the Visigoths in the Battle of Adrianople, now called Edirne (q.v.), Turkey. The battle was one of the costliest recorded battles of ancient times. Valens was succeeded by the Roman general Theodosius I (q.v.).

VALENTINE'S DAY, SAINT. See SAINT VALENTINE'S DAY.

VALENTINIAN, name of three Roman emperors of the West.

Valentinian I (321–75), Emperor (364–75), born in Cibalae (near modern Osijek, Yugoslavia). He was an important military figure under the Roman emperors Julian (q.v.) and Jovian (about 331–64), and upon the death of the latter, he was elected by the Roman army to succeed him. Valentinian chose his brother Valens (q.v.) to share his rule, as Roman emperor of the East and reserved for himself Illyricum (see ILLYRIA), Italy, Gaul (roughly conforming to modern France), Britain, Spain, and Africa. Under his administration the Romans won wars in Africa and Britain and against the Germanic tribes, the Alamanni and the Saxons (qq.v.). Valentinian furthered education throughout his empire and provided medical care for the poor of Rome; although an orthodox Christian, he was tolerant in matters of religion.

Valentinian II (371–92), Emperor (375–92), the son and successor of Valentinian I. He shared the first eight years of his reign with his brother Gratianus (q.v.); his share of the Western Empire comprised Africa, Italy, and part of Illyricum. During his minority, his mother administered the government. In 387 he was driven from Italy by Magnus Clemens Maximus (d. 388), who had arranged Gratianus' death in 383. Valentinian then sought refuge with Theodosius I (q.v.), Roman Emperor of the East, who restored him to power in 388. Valentinian was murdered, probably by Arbogast (d. 394), the Frankish general who installed the puppet emperor Eugenius (d. 394) on the throne.

Valentinian III (419–55), Emperor (425–55). He was put on the throne under the regency of his mother by Theodosius II, Roman Emperor of the East (401–50). Valentinian was weak; from 433 to 454 his general Flavius Aetius (396?–454) was the actual ruler. During his reign, much of the Western Empire was ravaged by barbarians; Africa was seized by Genseric (q.v.), King of the Van-

dals (q.v.), in 429, and the Danubian provinces, Gaul, and Italy were invaded by Attila (q.v.), King of the Huns (q.v.), in 441. Aetius won a great victory over Attila in 451 at Chalons-sur-Marne, Gaul. Valentinian killed Aetius in 454 but was murdered the following year by two of the general's supporters.

VALENTINO, Rudolph, real name RODOLPHO D'ANTONGUOLLA (1895–1926), Italian-born American motion-picture actor, born in Castellana. He arrived in New York in 1913 and subsequently worked as a gardener, dishwasher, and dancer. In 1918 he began to appear in minor roles in Hollywood films. Valentino first achieved fame as a motion-picture star in 1921 in *The Four Horsemen of the Apocalypse*, but his greatest popularity came with *The Sheik* (1921). He appeared also in *Blood and Sand* (1922), *Monsieur Beaucaire* (1924), *The Son of the Sheik* (1926), and other motion pictures. Valentino became a United States citizen shortly before his death; he was widely mourned as the romantic idol of millions of women.

VALERA, Eamon de. See DE VALERA, EAMON.

VALERA Y ALCALÁ GALIANO, Juan (1824–1905), Spanish writer and diplomat, born in Cabra, and educated at the University of Madrid. He embarked upon a diplomatic career in 1847 and served in a number of European and American countries; from 1883 to 1886 he was minister to the United States. During his long career as a diplomat he also held various political posts, becoming undersecretary of state in 1868, a member of several cabinets, and, ultimately, a lifetime senator.

Valera enjoyed fame as a writer with his first novel, *Pepita Jiménez* (1874; Eng. trans., 1886), which remains his best-known work; it is a psychological study of a student for the priesthood, in conflict between sacred and profane love. Among his other novels, most of which are set in the Andalusian region of Spain, are *El Comendador Mendoza* (1877; Eng. trans., *Com-mander Mendoza*, 1893) and *Doña Luz* (1879; Eng. trans., 1891); *Cuentos* ("Short Stories") appeared in 1887. Valera's poetry is little esteemed but his literary criticism is considered perceptive and knowledgeable. He is also known for his letters, philosophical writings, and Spanish translations of foreign masterpieces. Valera's work is characterized by erudition, irony, and profound humanism; he is regarded as one of the greatest Spanish writers.

VALERIAN, any of various perennial shrubs or herbs of the genus *Valeriana*, in the Valerian family, Valerianaceae, native to cool, northern temperate regions. Only a few of the some 175

VALERIAN

species are native to North America. Valerians vary in height from 2 to 5 ft. and have thick, acrid-smelling roots and either simple or lobed leaves. The small, pink or white flowers grow in dense clusters and are often highly fragrant. The common valerian or garden heliotrope, *V. officinalis*, native to Europe and northern Asia, is cultivated as an ornamental; its roots are the source of a sedative drug. See **HELIOTROPE**.

VALERIAN, or (Lat.) PUBLIUS LICINIUS VALERIANUS (d. after 260 A.D.), Roman Emperor (253–60). Upon the murder of the Roman emperor Gaius Vibius Trebonianus Gallus (q.v.) and the death of Gallus' rival the provincial governor Aemilianus (206?–253), Valerian was proclaimed emperor by his troops. He appointed his son Publius Licinius Valerianus Egnatius Gallienus (q.v.) to rule jointly with him. Valerian was an able ruler, but throughout his reign barbarian incursions threatened every frontier of the empire. He left Gallienus in charge of the European wars in order to concentrate on the invasions of his eastern boundaries by the Goths (q.v.) and the Persians. The latter destroyed the Roman army and took Valerian prisoner at Edessa (now Urfa, Turkey) in 260. He died in Persian captivity, and Gallienus succeeded him.

VALÉRY, Paul Ambroise (1871–1945), French poet and man of letters, born in Sète, and educated at the University of Montpellier. In 1891 he discontinued his studies and in 1892 settled in Paris, where he entered the literary circle of the French poet Stéphane Mallarmé (q.v.). His early poems, written between 1889 and 1898 and collected subsequently in *Album des Vers Anciens* ("Album of Ancient Verse", 1921), were influenced by the work of Mallarmé and the symbolists (q.v.).

Early Prose and Verse. Valéry's first two prose works concern mastering intellectual techniques. In *Introduction à la Méthode de Léonard de Vinci* (1895; Eng. trans., *Introduction to the Method of Leonardo da Vinci*, 1929) he discusses the creative method of one of the world's universal geniuses. The work of fiction *La Soirée avec M. Teste* (1895; Eng. trans., *An Evening with Mr. Teste*, 1925) is concerned with the introspective processes of his principal character, a man of vast mental abilities.

After the publication of the latter work Valéry held posts in the civil service from 1897 to 1900 and in a news agency from 1900 to 1922. During most of this period he pursued studies in mathematics. A perfectionist in his work, he refused to have any of his poetry published until 1917, when the allegorical poem *La Jeune Parque*

("The Young Goddess Fate") appeared. In this poem he views the nature of the world as a combination of the forces of life and absolute essences. As in his later poetry, including *Le Cimetière Marin* (1920; Eng. trans., *Graveyard by the Sea*, 1932) and many of the poems in *Charmes* ("Odes", 1923), a rarefied analysis of human self-consciousness is conveyed in a severely classical form with sensuous, natural description and a musical technique.

Later Works. Valéry's later prose works consist of philosophical studies and meditations. In *Eupalinos ou l'Architecte* (1923; Eng. trans., *Eupalinos: or the Architect*, 1932), he develops a theory of architecture as the form of art most akin to music. In *Regards sur le Monde Actuel* (1933; Eng. trans., *Reflections on the World Today*, 1948) he is concerned with the ideological bases of modern politics. He was appointed a lecturer in politics at the Collège de France in 1937. His other works include *L'Âme et la Danse* (1924; Eng. trans., *Dance and the Soul*, 1951), *Variété I-V* ("Variety", 1924–44), and *L'Idée Fixe* ("Fixed Idea", 1932).

Valéry remains one of the greatest of modern philosophical writers in verse and prose. All of his work posits a conflict between contemplation and action that must be resolved artistically in order to grasp the meaning of life. He considered poetry the finest of creative techniques; in his own verse he attempted to make abstract ideas concrete through symbolic imagery and subtle rhythms. His prose writings present analyses of art, culture, and the potentialities of the human mind in a polished aphoristic style. The concentration of purpose and compression of thought in Valéry's work make it extremely difficult to understand.

VALHALLA (ON. *Valhöl*, "hall of the slain"), in Old Norse mythology, the hall of slain heroes, ruled by the king of the gods, Odin (q.v.), in the mythological realm of the gods, Asgard (q.v.). The hall had a roof made of shields and 540 doors, through each of which 800 heroes could walk abreast. The souls of heroic soldiers killed in battle were brought to Valhalla by warrior maidens called Valkyries (see **VALKYRIE**). The heroes fought during the day but their wounds healed before night, when they banqueted with Odin.

VALKYRIE, in Old Norse mythology, one of the warrior maidens who attended Odin (q.v.), ruler of the gods. The Valkyries rode through the air in brilliant armor, directed battles, distributed death lots among the warriors, and conducted the souls of slain heroes to Valhalla (q.v.), the great hall of Odin. Their leader was

Brunhild. The Valkyries play an important part in the opera *Die Walküre* ("The Valkyries", 1856) by German composer Richard Wagner (q.v.).

VALLADOLID, city in Spain, and capital of Valladolid Province, on the Pisuerga R., about 100 miles N.W. of Madrid. The city serves as a market for grain produced in the area. Its industrial products include textiles, leather goods, paper, chemicals, automobiles, aluminum, and railway equipment. Among the principal points of interest are the Church of Santa María la Antigua completed early in the 13th century; the 15th-century Colegio de Santa Cruz, which houses a museum; the 16th-century cathedral, an unfinished edifice in the late-Renaissance style; and the last residence of the Italian-born navigator Christopher Columbus (q.v.). The city is the site also of the University of Valladolid, founded in 1346. The city served as the capital of Spain before Madrid (q.v.). Pop. (1970) 236,341.

VALLANDIGHAM, Clement Laird (1820–71), American politician, born in New Lisbon (now Lisbon), Ohio, and educated at Jefferson College (now Washington and Jefferson College), Washington, Pa. He became a lawyer and served as a Democratic member of the United States Congress between 1858 and 1863. He was a firm believer in States' rights and a bitter opponent of the American Civil War; he became the leader of the Copperheads (q.v.), a group of Northern Democrats who opposed the war. His speeches against the war and the administration of President Abraham Lincoln (q.v.) were considered seditious, and he was arrested in 1863 and sentenced to a prison term. President Lincoln subsequently commuted the sentence to banishment to the Confederacy, from which Vallandigham went to Canada. The following year he returned to the United States, became supreme commander of the Sons of Liberty (see KNIGHTS OF THE GOLDEN CIRCLE). He helped write the national Democratic Party platform of 1864 and 1868.

VALLE D'AOSTA or **AOSTA**, region of N.W. Italy, bordered on the N. by Switzerland, on the E. and S. by the Italian region of Piedmont, and on the W. by France. The region is contiguous with Aosta Province; the provincial and regional capital is the town of Aosta. Flowing in a N.W. to S.E. direction through the province is the Dora Baltea R.; the valleys of this river and its tributaries dominate the region. Along the mountainous borders of the Valle d'Aosta rise the Alpine peaks of the Matterhorn (14,688 ft.), Monte Rosa (15,203 ft.), and Mont Blanc (15,771 ft.). Natural transportation routes to France and Switzerland

are formed by the valleys and mountain passes of the region, among which are Little Saint Bernard Pass and Great Saint Bernard Pass (see SAINT BERNARD). In addition, tunnels have been built through the mountains. Agriculture, particularly the cultivation of cereals, grapes, and potatoes, is the major economic pursuit of the region. Mining and tourism are other leading industries. The region contains many resorts, including Chatillon and Valtournanche and the mineral springs of Courmayeur, and a number of medieval castles. The population of the area is mainly Italian, and the official languages are French and Italian.

The capital city of Valle d'Aosta Region dates from 25 B.C. The house of Savoy gained control of the area in the 11th century A.D.; see SAVOY, House of. In 1927 Aosta Province was formed from a part of Turin Province in the region of Piedmont. The area was separated from Piedmont in 1945 and established as the separate region of Valle d'Aosta, with the S. portion returned to Turin. In 1968 Valle d'Aosta was designated one of the five autonomous regions of Italy.

Area, 1375 sq.mi.; pop. (1971) 109,252.

VALLEJO, city and port of California, in Solano Co., on San Pablo Bay, at the mouth of the Napa R., 25 miles N.E. of San Francisco. Transportation facilities include railroads and coastal and overseas steamers. The city is surrounded by a rich agricultural area, noted for fruits, grapes, grain, beets, and livestock. Among the industrial establishments in Vallejo are extensive flour mills, shipyards, and steelworks. The city was founded about 1849 and named in honor of General Mariano Guadalupe Vallejo (1808–1890), a prominent California soldier and pioneer who was a State senator in the first California legislature. From 1851 to 1853 Vallejo was the State capital. Pop. (1960) 60,877; (1970) 66,733.

VALLETTA, chief town, port, and capital of Malta, on the Mediterranean Sea, on the N.E. side of the island. It occupies a rocky tongue of land more than 3000 yds. long, on either side of which are fine harbors. Valletta is the chief administrative, commercial, and cultural center of Malta. It serves as a naval base for the British navy and the North Atlantic Treaty Organization (q.v.), or NATO. The principal architectural features are the residence of the governor, formerly the palace of the grand masters of the Knights of Saint John of Jerusalem (q.v.), also known as the Knights of Malta, and the cathedral containing tombs of the knights. Pop. (1971 est.) 15,401.

VALLEY, depression in the land surface usually occupied by a river. The chief agency in the for-

VALLEY FORGE

mation of a valley is erosion (q.v.) carried on by the running streams and assisted by the natural decay or weathering of the rocks in which the channels lie. The relative rapidity with which the two agencies perform their work determines the form of the valley. In dry regions where erosion along the river bed proceeds at a rapid rate the valley may be narrow and bordered by steep walls. With the lapse of time, however, erosion alone will widen the valley as the stream tends more and more to cut away the walls in proportion as the channel is lowered to base level, and when this stage is reached the course of the stream wanders from one side to the other, forming a flood plain by deposition of the silt that has been brought down from above. See *GEOLOGY: Geomorphology; RIVER.*

VALLEY FORGE, historic site of Pennsylvania, in Chester Co., on the Schuylkill R., about 20 miles N.W. of Philadelphia. Valley Forge State Park preserves a historic area of 2033 acres enshrining the valley where during the American Revolution (q.v.) about 11,000 men under General George Washington (q.v.) encamped, on Dec. 19, 1777, for the winter. After the American defeats at the battles of the Brandywine and Germantown (qq.v.) and the subsequent British occupation of Philadelphia, Washington chose Valley Forge for his winter quarters because it was defensible and strategically located to enable him to protect Congress, then in session at York, Pa., from a sudden British attack. Because of lack of supplies from the commissary department of the Continental Army and the bareness of the surrounding countryside, the men were without adequate shelter, food, or clothing, and lived in crude huts built by their own hands. Many died of starvation and cold, and at no time were more than half of them fit for active service. The period was one of the darkest of the American Revolution (q.v.). It was at Valley Forge, however, in February, 1778, that a general in the Revolutionary army, Baron Friedrich Wilhelm von Steuben (q.v.) trained, disciplined, and reorganized the army. On June 19, 1778, Washington abandoned his camp at Valley Forge in order to pursue the British across New Jersey.

The park contains many markers and mementos of the historic winter, including the remains of fortifications, Washington's headquarters, several national and State monuments, Washington Memorial Chapel, and Patriot's Hall, with historical exhibits such as Washington's headquarters flag.

VALLEY STREAM, village of New York, in Nassau Co., on Long Island, bordering Queens Bor-

ough of New York City on the S.E., and 16 miles S.E. of Manhattan. The surrounding area raises truck products, poultry, and dairy cattle, and the village manufactures costume jewelry, watches, electrical and electronic equipment, metal products, paper and wood products, airplane parts, food products, and apparel. Part of Valley Stream State Park, with recreational facilities, is in the village. First settled in 1647, the village developed only after World War I and was incorporated in 1925. Pop. (1960) 38,629; (1970) 40,413.

VALOIS, duchy and historic region in the Île-de-France included in the modern departments of Aisne and Oise in northern France. During the time of Roman occupation the people who were known as the Suessiones lived in the vicinity. Later, in the middle ages, the district was governed by independent counts and was a possession of the royal house of Valois (q.v.). Its historic capital was Crépy-en-Valois.

VALOIS, family name of a dynasty that occupied the throne of France from 1328 to 1589. The first Valois king, Philip VI, was elected to succeed his cousin, the last Capetian king (see *CAPET*), Charles IV who died without male heirs. Nine years later Edward III (q.v.), King of England, precipitated the Hundred Years' War (q.v.) by claiming the French throne through his mother Isabella of France (1292–1358), who was a Capet.

The continued male succession of Valois was secured by the application of Salic law (q.v.), which forbade inheritance of titles through female lines. By the 16th century the Valois rulers had ousted the English from French territory, united the French-speaking provinces, and embarked on enlargement south of the Alps. Foundations were laid for an absolute monarchy, and France grew almost to its present size, during the reign of Louis XI. The marriage of his son, Charles VIII, to Anne of Brittany (q.v.) eventually led to the French acquisition of that duchy. The last Valois ruler was succeeded by Henry IV (q.v.), a Bourbon (q.v.).

The reigns of the thirteen Valois kings, the first seven in direct father-to-son succession, were as follows: Philip VI, 1328–50; John II, 1350–64; Charles V, 1364–80; Charles VI, 1380–1422; Charles VII, 1422–61; Louis XI, 1461–83; Charles VIII, 1483–98; Louis XII, 1498–1515; Francis I, 1515–47; Henry II, 1547–59; Francis II, 1559–60; Charles IX, 1560–74; and Henry III, 1574–89.

See separate articles for each of the Valois monarchs. See also *FRANCE: History: The Valois Dynasty.*

VALONA. See **VLONE**

VALPARAISO, city in Indiana, and county seat of Porter Co., about 17 miles **S E** of Gary. The city is in a dairy and farm area where corn, oats, and fruit are grown. Magnets, bearings, and electrical equipment are manufactured. It is the site of Valparaiso University, founded in 1859. Settled in 1834, the city was incorporated in 1865. Pop. (1960) 15,227; (1970) 20,020.

VALPARAÍSO, city and port in Chile, and capital of Valparaíso Province, on the Pacific Ocean, 68 miles **NW** of Santiago. Valparaíso is an important manufacturing center, producing machinery, cotton goods, tobacco, refined sugar, and liquor. The city is the site of Catholic University (1928) and a technical university (1926).

Valparaíso was founded by the Spanish in 1536. It was destroyed by an earthquake in 1855, and again in 1906. It has been rebuilt as a modern city. Pop. (1972 est.) 296,000.

VALUE, in economics, a word most commonly used to designate the power of a commodity to command other commodities in exchange, or the total money revenue for which an item will sell. The potential capacity of an object to meet human needs is sometimes called value, or value in use, in the terminology of the classical economists. In modern economics, the term "utility" has for the most part supplanted this use of the word "value", and value has become related to the concept of marginal utility (q.v.). The term "value" also signifies the relationship between an object and an individual, in which the individual, in order to obtain a certain satisfaction, must have use or possession of the object. Value in this sense of the term is frequently called subjective value, to distinguish it from objective or exchange value (the first conception noted above). A distinction is usually made between market value and normal or nat-

ural value. Market value is the purchasing power of a commodity in the open market on a given day, normal or natural value is the value that would prevail if competitive forces worked without friction. Market value may also be referred to as the exchange price of a commodity, and natural value, as the just price.

In Marxist theory, in the simplest terms, the value of a product is composed of, or created or determined by, all the labor involved in its production; see **MARX, KARL**.

Value Added. The term "value added" refers to the value created in a product in the course of manufacturing or processing, exclusive of such costs as those of raw materials, packaging, or overhead.

VALVE. See **MACHINE ELEMENTS**

VAMPIRE, in folklore, a corpse that rises from the grave during the night and, for nourishment, sucks the blood of sleepers. Various talismans and herbs supposedly avert vampires, but, according to tradition, they can be demolished only by cremation or by stakes driven through their hearts. Belief in vampires originated in ancient times and was especially widespread among the 18th-century Slavs (q.v.).

VAMPIRE BAT, common name applied to various small South American bats of the genera *Desmodus*, *Diaemus*, and *Diphylla*, belonging to the family *Desmodontidae*. The bats derive their sole nourishment from sucking mammalian blood. Vampire bats rarely exceed 3 in. in length, and their sharp front teeth are adapted to making razorlike slashes. The digestive tract of vampire bats is greatly modified for digestion of blood; the esophagus is extremely narrow, the stomach is small and tubular, and the intestine is short. Vampire bats attack man, as well as animals, and may transmit through their bite causative organisms of several diseases, notably

Vampire bat feeds on blood in a laboratory in England. UPI



VANADIUM

rabies (q.v.). *Desmodus rotundus*, a red-brown, tailless bat, lives in the forest regions from southern Mexico to Chile. The Brazilian vampire bat is the species *Diphylla ecaudata*. See BAT.

VANADIUM, metallic element with at.no. 23, at.wt. 50.95, b.p. 3379° C. (6114° F.), m.p. about 1917° C. (3482.6° F.), sp.gr. 6.0 at 20° C., and symbol V. The element ranks twentieth in abundance among the elements in the crust of the earth, and was discovered about 1830 by the Swedish chemist Nils Gabriel Sefström (1787–1845), who named it after the Scandinavian goddess Vanadis. Vanadium is never found in the pure state, but occurs in combination with various minerals throughout the world. Vanadium-ore minerals in the United States are roscoelite, found in Colorado; vanadinite, found in Arizona and New Mexico; and carnotite, found in Colorado and Utah. In 1970 the annual production of vanadium in the U.S. amounted to about 5300 tons, more than 30 percent of the total world production of vanadium. The other major producer is Peru, which has large deposits of patronite, a vanadium-sulfur compound.

The metal ranges in color from silver white to steel gray. It takes a very high polish and is one of the hardest of all metals. It is soluble in nitric and sulfuric acids, and insoluble in hydrochloric acid, dilute sodium hydroxide, and dilute alcohol. Vanadium forms several acidic oxides, the most important of which are the dark green trioxide, V_2O_3 , and the orange pentoxide, V_2O_5 . Other important compounds include vanadium monosulfide, VS; vanadium trisulfide, V_2S_3 ; vanadium dichloride, VCl_2 ; vanadium trichloride, VCl_3 ; vanadium dihydroxide, $V(OH)_2$; and metavanadic acid, HVO_3 .

Because of its hardness and great tensile strength, the metal is used in many alloys such as ferro-vanadium, nickel vanadium, and chrome vanadium. Chrome-vanadium steels are used in the production of springs, and in transmission gears and other engine parts. Titanium-vanadium alloys are used for missile cases, jet-engine housings, and nuclear reactor components. As a catalyst (see CATALYSIS), vanadium has largely replaced platinum in the manufacture of sulfuric acid, and is employed widely as a photographic developer, as a reducing agent, and as a drying agent in various paints.

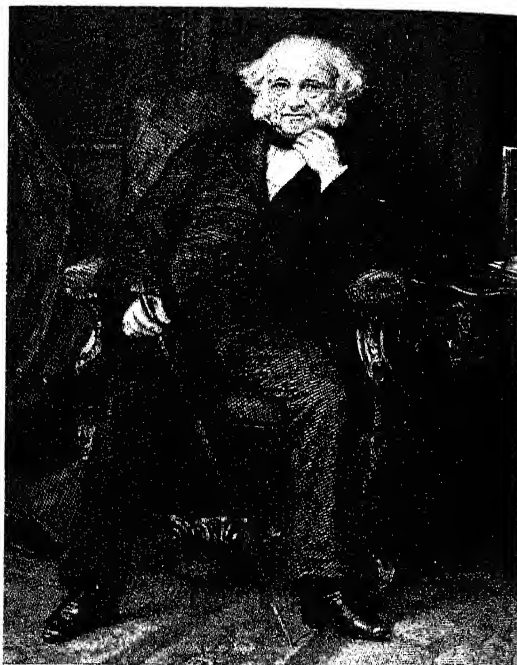
VAN ALLEN BELTS. See RADIATION BELTS.

VANBRUGH, Sir John (1664–1726), English dramatist and architect, born in London. His first and most famous plays were the comedies, *The Relapse*, which enjoyed great success in 1696, and *The Provoked Wife*, which triumphed the following year. He subsequently wrote ad-

aptations of French plays. The first edition of his collected works appeared in 1893.

Vanbrugh was drawn away from the stage by his growing reputation as an architect. He worked on a massive scale, in the baroque (q.v.) style. Among his most famous buildings are the Queen's Theatre (1705) in London and Blenheim Palace near Woodstock, which was commissioned in 1705 but not completed until 1724. Vanbrugh was knighted in 1714.

VAN BUREN, Martin (1782–1862), eighth President of the United States, born in Kinderhook, N.Y., the son of a farmer. Privately educated, he was admitted to the bar in 1803. He served in the New York State Senate from 1813 to 1820,



Martin Van Buren

and from 1815 to 1819 was also attorney general of the State. An adroit politician, he became a leader of a group known as the Albany Regency, which controlled State politics through the skillful manipulation of patronage. Van Buren in particular came to be called "the Little Magician" in recognition of his effective partisanship. In 1821 he was elected to the United States Senate, where he worked to promote the Democratic Party (q.v.). He supported the successful candidacy of Andrew Jackson (q.v.) for the Presidency in 1828. Elected governor of New York in that year, Van Buren resigned to become secretary of state in Jackson's cabinet. In 1831 he was appointed minister to Great Britain, but the Sen-

ate refused to confirm his appointment. He became the Democratic candidate for Vice-President when Jackson ran for a second term, and was elected in 1832. With Jackson's support he was nominated for President in 1836. In the election he defeated several regional candidates of the anti-Jacksonian Whig Party (q.v.), gaining a small popular majority.

As President, Van Buren was confronted by the Panic of 1837, a severe financial crisis produced by crop failures, the repudiation of debts by many States, and the breakdown of an inadequate banking system (see *BANKS AND BANKING: The United States Banking System*). Van Buren's efforts to deal with the crisis, and in particular his suggestions for a reform of the economy, brought him considerable unpopularity. Although he was renominated by the Democrats in 1840, he was defeated in the election by the Whig candidate, William Henry Harrison (q.v.).

In the Democratic convention of 1844, Van Buren opposed the annexation of Texas as a slave State. This position cost him support among Southerners, and he withdrew his candidacy, causing the convention to turn to James Knox Polk (q.v.), who became the eleventh President. Van Buren's opposition to the extension of slavery brought him the Presidential nomination of the Free-Soil Party (q.v.) in 1848. His presence on the ballot drew votes from the Democrats, ensuring the election of Zachary Taylor (q.v.), a Whig. Returning to the Democratic Party, Van Buren supported its candidates until 1860, when his antislavery views led him to urge the election of Abraham Lincoln (q.v.), the Republican candidate. Van Buren was one of the most active of American politicians. He is remembered for his role in the development of the party system and for his statesmanlike attitudes during a period of crisis. N.W.P.

VANCOUVER, city in Washington, and county seat of Clark Co., at the head of deep-water navigation on the Columbia R., 14 miles N. of Portland and 65 mi. from the Pacific coast. It is served by several railroads and by ocean and river steamers, and is connected by bridge and ferry with Portland on the opposite bank of the river. The city is the center and shipping point of a region yielding timber, livestock, dairy products, poultry, hay and forage crops, grain, potatoes, vegetables, walnuts, prunes, strawberries, apples, and pears. It is an important grain-shipping point, and is the distributing point for the power provided by the Bonneville and the Grand Coulee dams. Industries include lumbering, paper production, aluminum processing, and diversified small manufacturing.

Vancouver is the oldest city in Washington, established in 1825 as a fur-trading post of the Hudson's Bay Company (q.v.). The region of the city became United States territory in 1846, and Vancouver was made the county seat in 1854. It was incorporated in 1858, and it was chartered as a city in 1889. Pop. (1970) 42,493.

VANCOUVER, city and seaport, s.w. British Columbia, Canada, on the s. shore of the Burrard Inlet (an arm of the Strait of Georgia), near the border with Washington State. The city is the principal commercial, financial, and industrial center of British Columbia. It is also a leading Pacific Ocean port and is served by major highways and railroads and by a nearby international airport. The city's manufactures include forest products, processed food, refined petroleum, textiles, and metal goods.

Vancouver is a cosmopolitan city containing many reminders of Europe and E. Asia. Its business center is situated on a small peninsula bordered by Burrard Inlet and False Creek. To the N. is Stanley Park, the largest of the city's many green areas, and to the E. is Chinatown, which contains the largest Chinese community in North America after that of San Francisco.

Among Vancouver's many cultural attractions are the Vancouver Art Gallery; the Maritime Museum; the Centennial Museum, which includes the H. R. MacMillan Planetarium; and Queen Elizabeth Theatre, the home of the Vancouver Opera Association and Vancouver Symphony Orchestra. Nearby are the University of British Columbia and Simon Fraser University.

History. Salish Indians inhabited the site of Vancouver when the Spanish explorer José María Narvaez discovered (1791) the area. The first white settlement occurred about 1862, and the community became known as Gastown and later (1870) as Granville. In 1886 it was renamed after George Vancouver (q.v.), who had explored the region in 1792, and was incorporated as a city. Pop. (1976) 410,188; Census Metropolitan Area 1,166,348.

VANCOUVER, George (1757-98), British naval officer and explorer, born in King's Lynn, England. He joined the navy when he was thirteen, and served with British explorer Captain James Cook (q.v.) in his second and third voyages, from 1772 to 1775 and from 1776 to 1780, respectively. In 1791 he began an expedition to explore the Pacific coast of North America. He reached his destination in 1792 and spent the next three years surveying the coast; during this period he became the first man to circumnavigate the island now named Vancouver Island in his honor. In 1795 Vancouver returned to England.

VANCOUVER ISLAND

VANCOUVER ISLAND, island of the Pacific Ocean, in s.w. British Columbia, Canada. The largest island off w. North America, it is about 460 km (286 mi.) long and has an area of 31,285 sq.km (12,079 sq.mi.). It is separated from the mainland by a series of narrow waterways. Most of the island is dominated by the Vancouver Island Ranges, which are extensions of the Coast Ranges of Oregon and Washington. The loftiest peak is Golden Hinde (2200.3 m/7219 ft. high). In the s.e. is a narrow low-lying coastal plain, which contains the island's major cities, Victoria (the provincial capital) and Nanaimo. The w. coast of the island is indented by picturesque fjords.

Vancouver Island has a moist and mild climate, and much of it is heavily forested. The principal industries are lumbering, fishing (especially for salmon and herring), and mining (chiefly for copper and iron ores).

History. James Cook (q.v.) discovered the island in 1778. In 1792 it was surveyed by George Vancouver (q.v.), for whom it is named. In 1849 the island became a British crown colony, and in 1866 it was united administratively with British Columbia. Pop. (1976) 441,407.

VANDALS, ancient Germanic tribe of Jutland (q.v.) who migrated to the valley of the Oder R. about the 5th century B.C. During the 2nd and

3rd centuries A.D. they settled along the Danube R. They entered Gaul (now France) in 406, invaded Spain in 409, and fought in the latter country against both the Visigoths (see GOTHs: *Visigoths*) and the Romans. Genseric (q.v.) became king of the tribe in 428, and under him the Vandals achieved their greatest power. They moved to Africa the following year, and there defeated the Romans. Genseric's sovereignty was recognized by Roman Emperor Valentinian III (see under VALENTINIAN) in 422. The Vandals predominated in Africa by 435 and conquered Carthage in 439. Their navy ruled the western Mediterranean Sea and they looted and plundered in various parts of Italy, including Rome in 477. The tribe was Arian (see ARIUS) and it dealt severely with orthodox Christians. The Vandals began to decline after Genseric's death in 477, and in 533 they were defeated by Byzantine general Belisarius (q.v.). The modern usage of the word "vandal" reflects the dread and hostility the tribe precipitated in other people by their looting and plundering, particularly of Rome.

VAN DE GRAAFF GENERATOR, in nuclear physics, an electrostatic machine for the generation of extremely high voltages; see ELECTRICITY: *Electrostatics*; NUCLEAR ENERGY. It was developed in 1933 by the American physicist Robert Jemi-

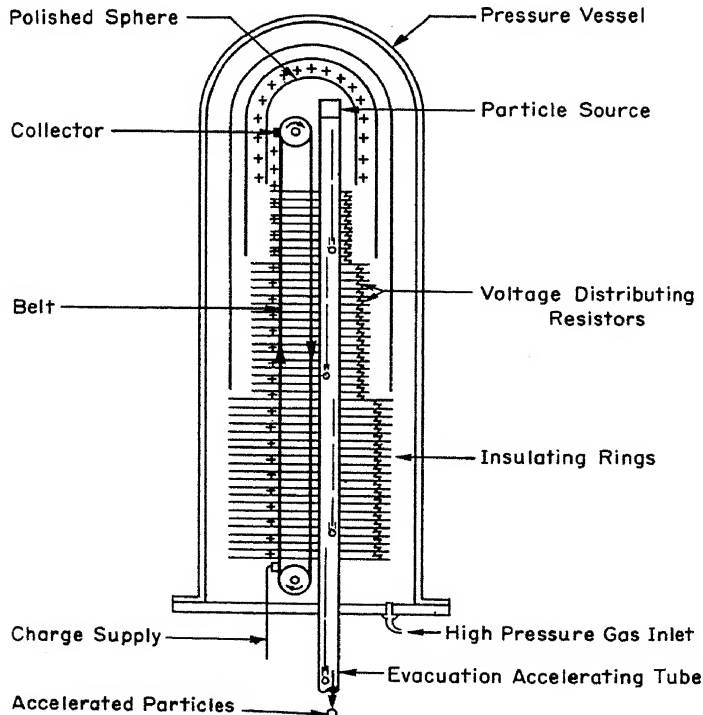


Diagram of a Van de Graaff generator.

son Van de Graaff (1901–67). The generator consists of a high-voltage terminal, usually a metal sphere, mounted at the top of an insulating column. Continuous belts of dielectric material such as rubber-impregnated cotton run from pulleys at the base of each column to pulleys within the spheres themselves; see DIELECTRIC; INSULATION. On one of these belts a positive electric charge of approximately 10 kilovolt potential is sprayed from a metal comb with sharply pointed teeth, which is mounted parallel to the moving belt. A negative charge of the same potential is similarly applied to the other belt. As the belts carrying their charges move up into the spheres, the charges are removed by other combs and applied to the body of the spheres. As the belts continuously pick up charges and deliver them to the spheres a potential difference of as high as 5,000,000 volts is built up between them. The Van de Graaff generator is used to accelerate a beam of ions (see ION) for bombarding and breaking up or otherwise altering the nuclei in a small target set in the path of the beam. See ACCELERATORS, PARTICLE; ATOM AND ATOMIC THEORY; CYCLOTRON.

VANDEGRIFT, Alexander Archer (1887–1973), United States Marine Corps officer, born in Charlottesville, Va., and educated at the University of Virginia (1906–08). He was commissioned a second lieutenant in the Marine Corps in 1909 and served with distinction from 1912 to 1923 in various campaigns in Latin America. Later he was attached to the Marine Corps headquarters in Washington, D.C., and to regimental and diplomatic posts in China (1927–29, 1935–37). Vandegrift had risen to the rank of brigadier general by 1940. Sent to the South Pacific in 1942, he led the 1st Marine Division to victory in the first large-scale U.S. offensive against the Japanese during World War II, the savage battle for Guadalcanal, one of the Solomon Islands. The next year he commanded the I Marine amphibious Corps in another memorable battle, the landing on Bougainville, the last Japanese island stronghold in the Solomons. Vandegrift was promoted to the rank of lieutenant general in 1943, appointed eighteenth commandant of the U.S. Marine Corps in 1944, and made a general in 1945, the first marine officer to attain that rank. He retired in 1948.

VANDENBERG, Arthur H(endrick) (1884–1951), American newspaper editor and United States Senator, born in Grand Rapids, Mich. He was graduated from high school in 1900, worked part of a year as a reporter on the Grand Rapids *Herald*, and then spent a year attending law school at the University of Michigan. In 1902 he

returned to the *Herald*; four years later, at the age of twenty-two, he became editor and publisher of the paper.

Vandenberg rapidly emerged as a powerful figure in State politics, becoming a member of the Michigan Republican Central Committee in 1912 and chairman of the Republican State convention in 1916. In 1928 he was appointed to fill out a term in the United States Senate; he retained the Senate seat by election until his death.

During his early legislative career, Vandenberg was an outspoken critic of Democratic foreign policy. The experience of World War II, however, caused him to renounce his isolationist views. A leading advocate of a bipartisan foreign policy after the war, he served in San Francisco in 1945 as a U.S. delegate at the founding conference of the United Nations. As chairman (1947–49) of the Senate Committee on Foreign Relations, he vigorously supported the European Recovery Program (q.v.). Vandenberg also favored formation of the North Atlantic Treaty Organization (q.v.).

VANDERBILT, name of a distinguished family of American industrialists and philanthropists, prominent in the development of steamship and railroad companies and in finance. The most important members include the following.

Cornelius Vanderbilt (1794–1877), born on Staten Island, N.Y. He entered the transportation business at the age of sixteen, when he established a freight-and-passenger ferry service between Staten Island and Manhattan. He owned a fleet of schooners during the War of 1812, entered the steamer business in 1818, and bought his first steamship in 1829. Rapidly expanding his operations, he became a vigorous competitor, reducing his rates and simultaneously improving his ships. Vanderbilt soon controlled much of the Hudson R. trade; when his rivals paid him to take his traffic elsewhere, he set up routes from Long Island Sound to Providence, R.I., and Boston, Mass. By 1846 he was a wealthy man, widely known as Commodore Vanderbilt. In 1851, during the height of the California gold rush, he opened a land-and-sea line from New York State to San Francisco, providing forty-niners (q.v.) with quick transport and low fares. In 1855 he effected passenger and cargo service between New York and Le Havre, France.

Vanderbilt sold his steamboats in 1862 and began to buy railroad stock; within five years he controlled the New York Central Railroad. He continued his policy of improving service and greatly expanded his railroad holdings. Al-

VANDERBILT UNIVERSITY

though in 1868 he failed to gain control of the Erie Railroad, he established a direct rail route between New York and Chicago, Ill., in 1873.

Late in life Vanderbilt became an important figure in financial circles and a philanthropist; his endowments included \$1,000,000 to Vanderbilt University (q.v.) at Nashville, Tenn. At the time of his death his wealth was estimated to exceed \$100,000,000.

William Henry Vanderbilt (1821–85), son of Cornelius, born in New Brunswick, N.J. He was already a successful railroad executive in his own right when, about 1863, he joined the family enterprises. He served his father as chief aide and succeeded him as president of the New York Central and several other railroads. Carrying on the policies of his father, he invested heavily and successfully in a number of additional railroads. He gave substantial sums to Vanderbilt University, the College of Physicians and Surgeons of Columbia University, and other institutions of higher learning.

Cornelius Vanderbilt (1843–99), son of William Henry, born on Staten Island, N.Y. He became associated with the New York and Harlem Railroad about 1867, serving as president from 1886, about which time he began to act as head of the Vanderbilt family. He was a benefactor of the Cathedral of Saint John (see SAINT JOHN THE DIVINE, CATHEDRAL OF) in New York City, the New York Theological Seminary, and many other institutions.

Frederick William Vanderbilt (1856–1938), son of William Henry, educated at Yale University. He served as director of many of the railroads owned by the family. His magnificent home (1898) at Hyde Park, N.Y., and the surrounding 212 acres containing rare flora, were designated the Vanderbilt National Historic Site in 1940.

Harold Stirling Vanderbilt (1884–1970), nephew of Frederick William, educated at Harvard University. He was involved in the management of the New York Central R.R. and served as director of other corporations. In World War I he served as section commander with a submarine chaser detachment. He was the inventor, in 1925, of the card game known as contract bridge; see BRIDGE: *Contract Bridge*. Three times in his later life he was the skipper of a yacht representing America in international cup races.

VANDERBILT UNIVERSITY, coeducational privately controlled institution of higher learning, situated on 150 acres in Nashville, Tenn. The university was founded in 1873 as Central University; the present name was adopted the following year in honor of the American industrialist and philanthropist Cornelius Vanderbilt

(see under VANDERBILT), who donated \$1,000,000 to the institution. The university was opened for instruction in 1875 with departments of arts, law, medicine, and theology, to which were added departments of pharmacy and dentistry (1879, later discontinued), engineering (1886), and nursing (1925). The existing divisions were reorganized as schools in 1915, with the exception of the department of arts, which became the college of arts and science. At present, the university comprises the college of arts and science, the graduate school, and schools of divinity, engineering, law, management, medicine, and nursing. The degrees of bachelor, master, and doctor are conferred. In 1972–73 the library contained more than 1,000,000 bound volumes. In 1972–73 the student body numbered 6600 and the faculty totaled 1360.

VAN DER GOES, Hugo. See GOES, HUGO VAN DER.

VAN DER ROHE, Ludwig. See MIES VAN DER ROHE, LUDWIG.

VAN DINE, S.S., pen name of Willard Huntington Wright (q.v.).

VAN DOREN, American literary family; its best-known members are two brothers.

Carl Van Doren (1885–1950), writer and editor, born in Hope, Ill., and educated at the University of Illinois and Columbia University. In 1911 he became an instructor in English at Columbia University; from 1916 to 1930 he was associate professor. Van Doren was managing editor of the *Cambridge History of American Literature* (1917–21) and literary editor of the periodicals *The Nation* (1919–22) and *The Century Magazine* (1922–25). He also served as editor for the Literary Guild (1926–34), a book distribution enterprise he helped found, and he was a member of the committee on management of the *Dictionary of American Biography* (1926–36). His books include *American and British Literature Since 1890* (1925), written in collaboration with his brother Mark Van Doren; *Three Worlds* (1936), an autobiography; *Benjamin Franklin* (1938; Pulitzer Prize, 1939); *Secret History of the American Revolution* (1941); and *The Great Rehearsal* (1948). He edited *An Anthology of World Prose* (1935), *Benjamin Franklin's Autobiographical Writings* (1945), and *The Portable Swift* (1948). His first wife, Irita Bradford Van Doren (1891–1966), whom he married in 1912 and from whom he was later divorced, was on the staff of *The Nation* from 1919 to 1926 and was literary editor of the New York *Herald Tribune* from 1926 to 1963.

Mark Van Doren (1894–1972), poet, critic, and editor, born in Hope, Ill., and educated at the

University of Illinois and at Columbia University. He joined the Columbia University faculty in 1920, attained a full professorship in 1942, and continued to teach English there until 1959. Like his brother, he was associated with *The Nation*, serving as literary editor from 1924 to 1928 and as motion-picture critic from 1935 to 1938. Van Doren became a member of the American Academy of Arts and Letters (q.v.) in 1948 and served as president from 1956 to 1959. His books of incisive, intellectual verse include *Collected Poems 1928-38* (1939); Pulitzer Prize, (1940); *The Country Year* (1946); *Mortal Summer* (1953); and *Narrative Poems* (1964). In the field of literary criticism and biography, his most important writings include *The Poetry of John Dryden* (1920), *Shakespeare* (1939), *Nathaniel Hawthorne* (1949), and *Private Reader* (1968). Van Doren has also written numerous short stories, novels, plays, and childrens' books, and edited many anthologies. *The Autobiography of Mark Van Doren* appeared in 1958. His wife, Dorothy Graffe Van Doren (1896-), is also a writer. Among her numerous works are *Flowering Quince* (1927); *Those First Affections* (1938); a biography of her husband, *The Professor and I* (1959); and *Men, Women and Cats* (1960).

VAN DRUTEN, John William (1901-57), American dramatist and novelist, born in London, England. He first studied law, acquiring an LL.D. degree at London University in 1922, and from 1923 to 1926 was a lecturer in law at the University College of Wales. He became an American citizen in 1944. His first play, *The Return Half*, was produced in 1923 and was followed in 1928 by *Young Woodley*, which initially met censorship problems for being disparaging to the British public-school system. He is known chiefly as a writer of sophisticated comedy and his plays, some of them nostalgic and others fanciful, demonstrate not only sparkling wit but qualities of warmth and romance. His greatest stage successes were *The Voice of the Turtle* (1943) and *Bell, Book, and Candle* (1950); and his dramatic adaptations *I Remember Mama* (1944), from sketches about a Norwegian-American family by the American writer Kathryn Forbes (1909-66), and *I Am a Camera* (1951), from a collection of Berlin stories by the British author Christopher Isherwood (1904-). He attempted serious drama in *The Druid Circle* (1947) and directed not only most of his long-running plays but the musical comedy *The King and I* (1950). His other plays include *There's Always Juliet* (1931), *The Distaff Side* (1933), *Gertie Maude* (1937), *Old Acquaintance* (1939), and *The Damask Cheek* (1942). He wrote the novels *Young*

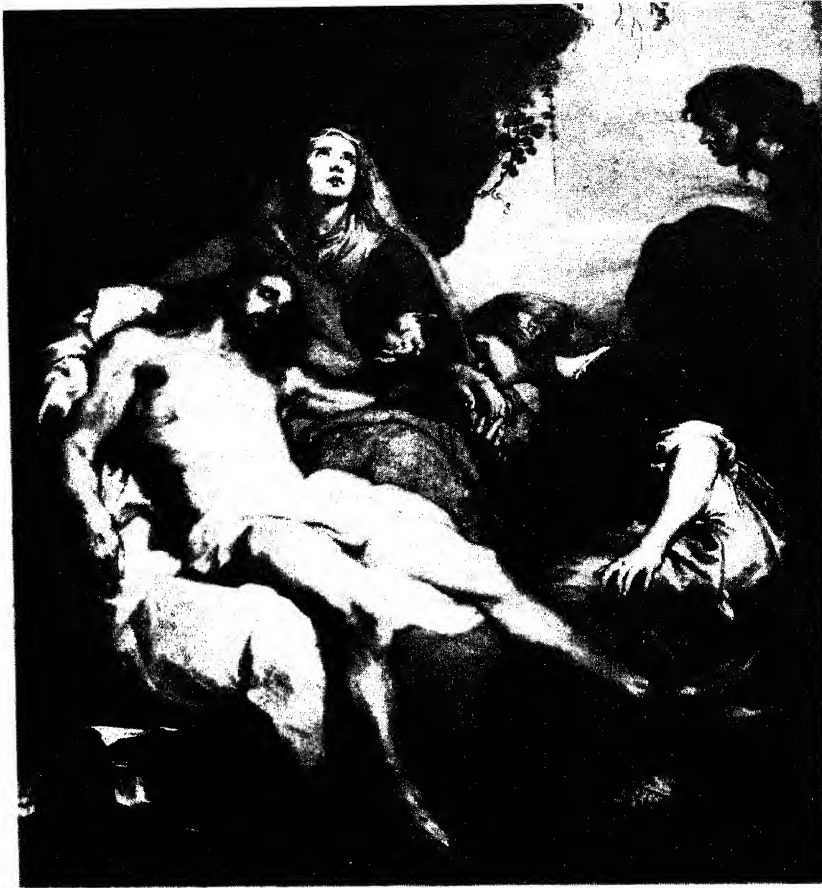
Woodley (1928), *Woman On Her Way* (1931), and *And Then You Wish* (1937), and also authored numerous screenplays.

VAN DYCK, Sir Anthony or VANDYKE, Sir Anthony (1599-1641), Flemish painter and etcher, born in Antwerp, Belgium. He was apprenticed at the age of ten to the painter Hendrick van Balen (1575-1632), and soon achieved recognition and popularity, working independently by the time he was sixteen and becoming a member of the painters' guild of Antwerp before he was nineteen. About 1617 he entered the workshop of the Flemish master Peter Paul Rubens; he assisted him on several paintings and made oil sketches for Rubens' engravers. In 1620 he spent several months in England where he executed portraits for King James I. In 1621 or 1622 he went to Italy and lived there for the next five years. During this period, however, he traveled widely and received many commissions; he

Portrait of James Stuart, Duke of Richmond and of Lennox (about 1633), by Sir Anthony Van Dyck.

Metropolitan Museum of Art - Gift of Henry A. Marquand





"Pietà" by Anthony Van Dyck, painted between 1628 and 1632.

Musée Royal des Beaux-Arts, Antwerp

painted mainly portraits, including many of the Genoese aristocracy, but also several religious works. The works of this period are influenced largely by the Venetians Titian, Tintoretto, and Paolo Veronese, and are notable for the opulence of their backgrounds and decorative details and for the vividness and richness of their colors and textures.

In 1627 Van Dyck returned to Antwerp, where he was in great demand as a portrait painter during the periods of Rubens' absence on diplomatic missions. Van Dyck was appointed in 1630 court painter to the Infanta Isabella, Spanish regent of the Netherlands. His portraits began to show less of the strong, dark colors representative of his Italian period and to exhibit a greater delicacy and airiness in the use of cooler tones. From the Flemish period date the portraits of the Infanta, of Maria de Médicis, mother of King Louis XIII of France, and of Frederick Henry, Prince of Orange-Nassau, and his wife and son. In 1632, at the invitation of King Charles I of England, Van Dyck settled in London as painter in ordinary to the royal household; he was knighted and given a pension. The many portraits of the king, Queen Henrietta Maria, their

children, and members of the English court painted by Van Dyck at this time were executed in part by the painter's students, working from Van Dyck's preliminary sketches. His own participation, although often limited, was essential. Van Dyck returned to Antwerp in 1634 to have his official title of court painter renewed by the Spanish governor of the Netherlands. He remained in his native city for almost two years, and in 1635 was made honorary president of the painters' guild of Saint Luke in Antwerp. To this period belong several portraits of the new governor Ferdinand, as well as of various members of the nobility, and numerous religious paintings. Returning to England in 1635, Van Dyck remained there, except for a brief visit to the Continent shortly before he died, and continued to produce portraits of the English royal family and other contemporary notables.

Van Dyck cannot be said to have founded an independent school, but he raised aristocratic portrait painting to its greatest height, exerting a strong influence upon later English painters, particularly such great portraitists of the 18th century as Sir Joshua Reynolds and Thomas Gainsborough. He also excelled in the field of

engraving and was among the first to exploit portrait etching. He planned a series of one hundred portrait etchings, known as the *Iconography*, of famous contemporary writers, poets, and artists. Eighteen of these portraits he etched himself; the remainder were engraved after his designs.

See separate biographies for persons mentioned without their birth and death dates.

R.S.M.

VANE, Sir Henry, commonly SIR HARRY VANE (1613–62), English statesman, born in Hadlow, Kent, and educated at the University of Oxford. His early sympathies with the Puritans (q.v.) led him to migrate to America in 1635, and the following year he was chosen governor of Massachusetts. His advocacy of religious tolerance, cost him his popularity, and he returned to England in 1637. There Vane served as joint treasurer of the navy from 1639 to 1641 and was knighted in 1640. Although a leader of the war party during the Great Rebellion (q.v.) against Charles I (q.v.), King of England, Vane remained a monarchist. In 1643 he was the chief negotiator of the Solemn League and Covenant with Scotland, which insured Scottish alliance by proclaiming Presbyterianism (q.v.) the official religion of England and Ireland as well as Scotland; see COVENANTERS. After the execution of Charles he became a leading figure in the Commonwealth (q.v.) and an intimate of Lord Protector Oliver Cromwell (see under CROMWELL). Upon Cromwell's dissolution of the Rump Parliament (q.v.) in 1653, however, the two became enemies. Vane was a member of Parliament during 1658 and 1659. After the Restoration (q.v.) in 1660 he was suspected of having plotted with General John Lambert (q.v.) to institute a dictatorship; he was imprisoned, and in 1662 he was executed for treason.

VÄNERN, LAKE. See SWEDEN: *The Land*.

VAN EYCK, name of two Flemish painters, see EYCK.

VAN FLEET, James A(lward) (1892–), United States Army officer, born in Coytesville, N.J. He was graduated from the U.S. Military Academy at West Point in 1915, assigned to the infantry, and sent overseas during World War I as commander of a machine gun battalion. Reassigned to the U.S. in 1919, he taught military tactics at various colleges and infantry schools. At the start of World War II, he was a colonel, commanding the 8th Infantry Regiment of the 4th Infantry Division.

During the Allied invasion of Normandy in 1944, Van Fleet's unit distinguished itself spearheading the landing operations on Utah Beach.

Subsequently he was given command of the 90th Infantry Division, the XXIII Corps, and the III Corps, was promoted to the rank of major general (1944), and served in the Rhine, Ruhr, Metz, and Ardennes areas. See WORLD WAR II.

After the war, Van Fleet was promoted to the rank of lieutenant general and dispatched to Greece from 1948 to 1950 as head of a U.S. military mission that aided the Greek army in its successful campaign against communist guerrillas. He was field commander of United Nations forces in Korea from 1951 to 1953; see KOREAN WAR.

The recipient of high military honors from many nations, Van Fleet retired from active duty in 1953 with the rank of general. He has since served briefly as a consultant to the secretary of the Army on guerrilla warfare (1961–62) and has been an executive and director with several business firms.

VAN GOGH, Vincent. See GOGH, VINCENT. **VANIER, George Philias** (1888–1967), Canadian diplomat, born in Montréal, Québec Province, and educated at Laval University. After being called to the bar in 1911 he served (1915–18) in World War I, losing a leg in combat in France, and attained the rank of major general. Between World War I and World War II he served as aide-de-camp to the Governor-General of Canada (1921–22, 1926–28), Canadian representative at the London Naval Conference (1930), and in London as secretary to the Canadian high commissioner (1931–38). Vanier became (1939) minister to France, and in the following year he served in Washington as secretary to the Joint Permanent Board for the Defense of Canada and the United States. After acting (1943) as minister to Allied governments-in-exile in London, he was again ambassador to France (1944–53). In 1959 he became the first French-Canadian to be appointed governor-general of Canada, and he served in this capacity until his death.

VANILLA, genus of climbing orchids, of the Orchid family (Orchideae), natives of tropical America and Asia. The flowers are thick, fleshy, and fragrant, but dull in color. The fruit of the *V. planifolia* occurs as fleshy pods, 6 to 9 in. long, from which the vanilla of commerce is extracted.

VAN, LAKE, saltwater lake in E. Turkey, between the sources of the Euphrates and Tigris rivers, at an altitude of more than 5000 ft. The lake is about 75 mi. long and between 10 and 50 mi. wide; it has an area of 1453 sq.mi. The shores of Lake Van are very irregular, and the lake is surrounded by densely wooded mountains.

Lake Van receives a few short streams, but it has no outlet. On the E. shore is the town of Van. **VAN LOON, Hendrick Willem** (1882–1944), American writer, born in Rotterdam, the Netherlands, and educated at Harvard and Cornell universities and at the University of Munich. He migrated to the United States in 1902 and became a U.S. citizen in 1919. During World War I van Loon served as an Associated Press correspondent in Europe. He taught history at Cornell University (1915–16) and at Antioch College (1922–23).

As a writer Van Loon defined his aim as “the humanization and popularization of history”. His works, written largely for young people and a good number illustrated by his own drawings, include *The Story of Mankind* (1921); *The Story of the Bible* (1923); *R.V.R., Life and Times of Rembrandt van Rijn* (1927); *Van Loon's Geography* (1932); and *Van Loon's Lives* (1942).

VAN RENSSELAER, name of a family of Dutch origin responsible for the settlement of a large part of New York State and, because of their vast land holdings, influential in State issues through the mid-19th century. The most significant members of the family are the following. **Kiliaen Van Rensselaer** (about 1595–1644), Dutch merchant and patroon, born in Amsterdam. He was a gem and gold merchant and in 1621 was one of the organizers of the Dutch West India Company (q.v.). After the Dutch settlement of the colony of New Netherland (now New York and New Jersey), he acquired a large tract of land along the Hudson R. under the then newly established patroon system; see PATROONS. Called Rensselaerswyck, it comprised much of the modern counties of Albany, Rensselaer, and Columbia. It was one of the earliest, largest, and most successful of the patroonships. Van Rensselaer himself never visited his estate, and the first family member to live on the land was Jeremias Van Rensselaer (1632–74). See NEW YORK: *History*.

Stephen Van Rensselaer (1764–1839), American political leader, military officer, and educator, born in New York City and educated at Harvard University. He was the grandson of the colonial politician Philip Livingston (see under LIVINGSTON) and a lineal descendant of Kiliaen Van Rensselaer. He inherited the great Van Rensselaer estate at the age of five.

A dominant figure in New York State politics, Van Rensselaer served in the State legislature (1789–95), as State lieutenant governor (1795–1801), and in the United States Congress (1822–29). In the War of 1812, as a major general of the New State militia, he directed the unsuccessful

assault on Queenston, Canada. He urged the construction of the Erie Canal (q.v.) and served actively on commissions connected with the project. Influential also in academic circles, he was a member (1819–39) of the Board of Regents of the University of the State of New York and served as the university chancellor (1835–39). In 1824 he helped establish in Troy, N.Y., the scientific school now called Rensselaer Polytechnic Institute.

Following Van Rensselaer's death, the still-huge family estate was divided between two sons. For 200 years tenants of patroonships had been required to pay a yearly fee in produce, service, or money; also, on sale of a leasehold, the tenant had to share significantly with the patroon all monies realized. The so-called anti-rent riots began in 1839 when tenants refused to pay the Van Rensselaer heirs a large debt that had accumulated. Similar rebellions flared in neighboring counties and eventually, as in the constitution of 1846, legal measures were introduced protecting tenants' rights. The patroon system gradually came to an end as the estates were broken up and sold either to the tenants or to land speculators. With the sale of the Van Rensselaer estate, the influence of the family in State matters declined.

VAN'T HOFF, Jacobus Hendricus (1852–1911), Dutch physical chemist, born in Rotterdam and educated at the Technicological Institute of Delft and the universities of Leiden, Bonn, Paris, and Utrecht. In 1876 he became a lecturer in physics at the Veterinary School in Utrecht and was professor of chemistry, mineralogy, and geology at the University of Amsterdam in 1878. He was appointed professor of chemistry at Leipzig in 1887 and at Berlin in 1896. Often called the father of physical chemistry, Van't Hoff achieved prominence very early when in 1874, at the age of twenty-two, he put forward a theory to explain the structure of organic compounds. His relation of the optically active carbon compounds to asymmetrical and three-dimensional structures laid the basis for the science of stereochemistry; see CHEMISTRY: *Major Divisions of Chemistry: Organic Chemistry; Physical Chemistry*. In 1901 Van't Hoff was awarded the first Nobel Prize in chemistry for his work relating thermodynamics (q.v.) to chemical reactions, and his studies of the properties of solutions; see REACTION, CHEMICAL. His later research on salt deposits was important to the German chemical industry.

VAN VECHTEN, Carl (1880–1964), American writer, music and dance critic, and photographer, born in Cedar Rapids, Iowa, and educated

at the University of Chicago. His name is of importance in several disciplines. He was assistant music critic (1906–07; 1910–13) for the *New York Times* and drama critic (1913–14) for the *New York Press*, and he wrote several volumes of music criticism. Next he turned to fiction, producing such popular novels as *Peter Whiffle* (1922), *The Tattooed Countess* (1924), and *Spider Boy* (1928). His own autobiography *Sacred and Profane Memories* appeared in 1932. The remaining decades of his life he devoted to photography, succeeding particularly in the field of portraiture. Van Vechter was for many years interested in Negro art and literature; he founded several pertinent collections, among them the James Weldon Johnson Memorial Collection of Negro Arts and Letters at Yale University, established in 1941.

VAN WERT, city in Ohio, and county seat of Van Wert Co., about 27 miles N.W. of Lima. The trade center for a grain and livestock region, manufactures include electronic equipment, paper and metal products, and machinery. Founded in 1835, Van Wert was incorporated in 1848. Pop. (1960) 11,323, (1970) 11,320.

VAPOR, in physics, term for substances in the gaseous state; see GAS; MATTER, STATES OF. The terms "vapor" and "gas" can be used interchangeably, although in practice, vapor is used for a substance that is normally in liquid or solid state, such as water, benzene, and iodine. It has been proposed that the use of the term "vapor" be restricted to gaseous substances below their critical point (q.v.), or the temperatures at which they may be liquefied by the application of sufficient pressure, and the term "gas" should be used above the critical temperature when the existence of the substance in the liquid or solid state is impossible. This usage is essentially arbitrary because all gaseous substances follow a similar behavior both above and below the critical point. See BOILING POINT; CRYOGENICS; HEAT; HEAT TRANSFER; TEMPERATURE.

If confined at any temperature, the vapors emitted from any substance exert pressure known as vapor pressure, and as the temperature of the substance is raised, the vapor pressure increases as a result of increased evaporation (q.v.). When the local vapor pressure above a liquid becomes equal to the total pressure because of heat, boiling will occur. At the boiling point, which for any temperature has a unique corresponding pressure, the vapor in equilibrium with the liquid is known as saturated vapor, as in the case of water vapor at 212° F. and 1 atmosphere pressure. Vapor at a temperature above the boiling conditions is known as

superheated vapor, as in the case of the water vapor in the air which is superheated, and will be partially condensed when the temperature is lowered at constant atmospheric pressure.

For most solids at ordinary temperatures and pressures, the vapor pressure is small or negligible. A finite vapor pressure exists, however, as the presence of water vapor over ice demonstrates. The vapor pressure can become important even for metals at elevated temperatures and reduced pressures. Thus the failure of a tungsten-filament light bulb is primarily due to evaporation, with its attendant increase in vapor pressure.

When a solution of two volatile substances, such as water and alcohol is heated, the resulting vapor will contain both substances, though generally in proportions different from the original solution. A higher percentage of the more volatile vapor is normally evaporated first; this principle forms the basis for the process of distillation (q.v.). See also DENSITY; STEAM AND STEAM ENGINEERING. F.La.

VAPOR LOCK, interruption of the flow of a fuel, such as gasoline (q.v.), in an overheated internal-combustion engine, caused by the bubbles of vapor or gas (qq.v.) in the fuel-feeding system. The cooling of the engine is usually sufficient to restore the flow; see CARBURETOR; INTERNAL-COMBUSTION ENGINE: *Components of Engines*. **VARANASI**, formerly BENARES or BANARAS, city of the Republic of India, in Uttar Pradesh State, on the N. bank of the Ganges R., about 400 miles N.W. of Calcutta. It lies in a fertile region, producing sugar cane and grains. The city is also an important commercial center. Silk brocade, gold and silver thread, filigree work, and brass articles are manufactured.

The city has few buildings built before the late 16th century, but its site was occupied in antiquity by the kingdom of Kashi, and to devout Hindus the city has always existed (see HINDUISM). It is to them the holiest of cities; Hindu pilgrims come to Varanasi from all parts of the world. Records of such pilgrimages date from the 7th century. Large throngs gather along the banks of the sacred Ganges R., where terraced landings, or *ghats*, lead down to the water. Hindus believe that immersion in the Ganges water cleanses them of sins and that death on its banks leads to salvation. The level portions of the ghats are used for funeral pyres.

From Ramnagar, across the river, the city of Varanasi gives an impression of splendor which is dissipated on closer view. The narrow streets wind circuitously between painted and carved buildings, many of them with overhanging gal-

leries. Among the more than 1500 temples, the best known are the mosque of Aurangzeb; the observatory of Raja Jai Singh and the Durga temple, both built in the 17th century; and the holiest of all temples, the Bisheshwar, or Golden Temple. Varanasi is also a center of learning, especially for the study of Sanskrit, centered at Benares College, founded in 1791 and maintained by the government. Banaras Hindu University, established in 1916, was the first denominational university in India under private control; it is now nonsectarian. Varanasaya-Sanskrit University was founded in 1958. Pop. (1971 prelim.) 560,296.

VARDON, Harry (1870–1937), British golfer, born in Jersey, Channel Islands. He won the British Open championship in 1896, 1898, 1899, 1903, 1911, and 1914. He also won the United States Open championship in 1900 and in his lifetime was the victor in sixty-two different golf tournaments. Vardon, who assumed professional status in 1903, was highly skilled in iron shots and made popular the so-called overlapping grip. He competed for the last time in championship play in 1927. A trophy awarded annually by the Professional Golfers' Association of America, or P.G.A., for low-average scoring is named after him. See also GOLF.

VARÈSE, Edgard (1883–1965), one of the most influential composers of the 20th century, noted for his view of music as organized, moving bodies of sound, dependent not on melody or harmony, but on color (timbre), mass, and relationship to space.

Born in Paris on Dec. 22, 1883, and raised in France and Italy, Varèse was trained in engineering, but studied music against his father's wishes. From 1907 to 1915 he lived in Berlin, then settled permanently in New York City.

In the 1920's and 1930's Varèse put his views into practice in works such as *Hyperprism* (1922), for winds and percussion; *Ionisation* (1933), for piano, percussion, and two sirens; and *Density 21.5* (1935), for unaccompanied flute. The later *Déserts* (1954; revised 1961) integrated tape-recorded sounds with wind and percussion instruments and piano. *Poème électronique* (1958) was performed at the Brussels world's fair directly from tape on 425 loudspeakers placed at selected points in the Philips Pavilion (designed by the French architect Le Corbusier); it thus utilized the architecture of the building as part of the music's spatial design. Varèse died in New York City on Nov. 8, 1965.

VARGAS, Getulio Dornelles (1883–1954), Brazilian statesman, born in São Borja, and educated at the University of Pôrto Alegre. He prac-

ticed law, and from 1922 to 1926 sat in the national congress. Subsequently he served as minister of finance (1926–27), and as governor of Rio Grande do Sul (1928–30). In 1930 Vargas ran for the presidency but was defeated. Charging fraud, he took over the government by a coup d'état. He was himself overthrown in 1945 but was elected to the presidency in 1950. Challenged with overwhelming military opposition in 1954, Vargas committed suicide.

VARIABLE STARS. See STARS: *Variable Stars*.

VARIATION, in biology, structural or functional deviation of an organism from the parent form or type; see HEREDITY. Most variations are produced by mutation (q.v.), the accidental alteration of the hereditary determiners, or genes. The variation is passed from generation to generation by the genes; see EVOLUTION. Other variations are brought about solely by environmental changes, and are called modifications. The latter usually persist only for the life of the modified individual and cannot be handed down to other generations; see ADAPTATION.

Variations resulting from chromosomal changes (see CHROMOSOME) may be caused by a doubling, or other numerical change, of the original chromosome number; or by a change in the position or structure of the genes. An increase in the chromosome number usually results in larger size and more vigorous growth among organisms. A change in the position or structure of one or more genes produces variation by altering the so-called commands of genes that regulate cell growth and development; see CELL; NUCLEIC ACIDS. Although most genetic alterations occur through natural phenomena, such as mechanical breaking of chromosomes during cell division, they may be produced by excessive exposure of organisms to X rays or to radiation from the sun and outer space, as well as from radioactive substances; see COSMIC RAYS; RADIATION; RADIOACTIVE FALL-OUT.

If a variation contributes to the survival of a species, it will tend to persist. This is called the process of natural selection (q.v.). If a variation reduces the chances of survival, however, the species involved will tend to become extinct. Thus the effect of the variation depends almost entirely on the environment in which the variant lives. For example, a mutation that causes a caterpillar to look like a poisonous snake is likely to enhance chances of survival of the insect, because its predators, such as birds, will hesitate to attack. Such a mutation provides protective mimicry, a phenomenon of which there are many cases in nature.

VARIATION, in music, the technique of transforming a theme or musical idea by harmonic, melodic, or rhythmic changes, or by a combination of these changes. The theme is first simply stated and then repeated in a variety of ornamented or altered forms. One of the oldest variation forms is the double, in which the fundamental theme is elaborately ornamented but not otherwise changed. A theme with variations consists of a statement followed by several successive modifications. This form reached its greatest variety and complexity in the *Goldberg Variations* (1742) for keyboard by the German composer Johann Sebastian Bach (see under BACH). Two Austrian composers of the classical period, (Franz) Joseph Haydn and Wolfgang Amadeus Mozart (qq.v.), did much to develop the modern variation form, using it for independent works and for movements of sonatas and other works in sonata form; see SONATA.

Variations were brought to a peak of complexity and mastery by the German composers Ludwig van Beethoven and Johannes Brahms (qq.v.). Beethoven and later composers used the variation form in diverse ways in symphonic and chamber works. Brahms' *Variations on a Theme by Haydn* (1873) is an example of an orchestral work consisting entirely of a theme and variations. Later works in variation form include the *Enigma Variations* (1899), by the British composer Sir Edward Elgar, and *The Young Person's Guide to the Orchestra* (1945), by his countryman (Edward) Benjamin Britten (qq.v.). **VARICELLA**. See CHICKEN POX.

VARICOSE VEIN, a dilated and often tortuous vein. If a vein becomes permanently dilated it is called a varicose vein. This dilatation occurs because the valves in the vein no longer function properly and/or because there is an increased blood volume in the vein. Theoretically any vein can develop varicosities but certain veins are more likely to.

When veins in the submucous membranes of the rectum dilate, hemorrhoids (q.v.), or piles, result. These may be painful and may bleed. Treatment varies. Often surgery is necessary. When the spermatic veins in the scrotum dilate, a varicocele results. This most commonly occurs on the left side and may enlarge, become annoying or painful, and require surgery.

The most common varicose veins are the superficial leg veins. These become rather prominent and readily visible. In addition to being a somewhat unsightly bluish color, they may cause ankle edema and skin ulcerations. Venous thromboses (blood clots), which are tender and painful, may develop and may break off and be-

come obstructions elsewhere, particularly in the pulmonary arterioles. Simple superficial varicose leg veins are treated by applying pressure all along them with an elastic stocking, by sclerosing them with a chemical solution, or by removing them surgically. In these latter instances, because the blood usually carried in them is diverted to the deep leg veins, the deep veins must be functioning normally. Treatment of venous thrombosis is complex, sometimes requiring surgery.

D.S.T. **VARNA**, formerly STALIN (anc. *Odessus*), city and port of Bulgaria, in Varna Province, on the Black Sea, about 235 miles N.E. of Sofia. It is a leading seaport of Bulgaria and an industrial center. In the city are food-processing plants, shipyards, and factories engaged in the production of glass, metal goods, and textiles. Among the chief exports are dairy products, grains, and livestock. The city is a popular vacation resort. Institutions of higher learning include a university, founded in 1920, a medical school, and a naval academy.

History. Greek colonists founded Odessus on the site of Varna in the 6th century B.C. In the 1st century A.D. the settlement became a Roman possession. It was ruled by the Byzantines, Bulgarians, and Ottoman Turks during the Middle Ages. In 1444 Varna was the site of a battle in which a force under the Turkish sultan Murad II (see under MURAD) crushed a Christian army commanded by Władysław III, King of Poland and Hungary (1424-44), and the Hungarian leader, János Hunyadi (q.v.). This engagement ended serious efforts to prevent the Turks from overrunning S.E. Europe. Varna was occupied by Russian troops in 1828, and by British and French troops in 1854, during the Crimean War (q.v.), when it served as a base of operations against the Russians. By the terms of a treaty drawn up at the Congress of Berlin, after the Russo-Turkish Wars (q.v.), Varna became part of the newly created Bulgarian principality; see BERLIN, CONGRESS OF. The city was renamed in honor of the Soviet premier Joseph Stalin (q.v.) in 1949; the name Varna was subsequently restored in 1956. Pop. (1971 est.) 230,500.

VARNISH, transparent solution produced by heating a drying oil, resin, drier, and a solvent together; see RESINS. If applied as a thin film, varnish gives a hard transparent coating upon evaporation (q.v.) of the solvent, and oxidation (q.v.) and polymerization; see CHEMICAL COMPOUNDS, SYNTHETIC: *Paints and Coatings*.

The numerous variations in composition and preparation of varnish prevent its classification, and some products are wrongly called varnishes.

VARRO

The so-called spirit varnish, for example, is a resin dissolved in a volatile solvent that contains no drying oil, and asphalt varnish is a solution of asphalt and a solvent that gives opaque, black coatings. See also LAC; LACQUER.

VARRO, Marcus Terentius (116–27 B.C.), Roman scholar, born in the Sabine town of Reate. He fought unsuccessfully in several campaigns under the Roman general Gnaeus Pompeius Magnus, called Pompey the Great (see under POMPEIUS), but was later pardoned by Pompey's rival, the Roman statesman and general Gaius Julius Caesar (q.v.), who in 47 B.C. employed him to administer the proposed public library. Varro, the leading Roman scholar of his day, was a prolific writer and is said to have composed 74 different works comprising about 620 books. He wrote on virtually every field of study of his time. Varro's extant works consist of 600 prose and poetry fragments of *Saturarum Menippearum Libri CL* ("150 Books of Menippian Satires", about 81–67 B.C.); two complete and four fragmented volumes of *De Lingua Latina Libri XXV* ("Twenty-five Books on the Latin Language", about 43 B.C.); and *Rerum Rusticarum Libri III* ("Three Books on Farming", 37 B.C.).

VASARI, Giorgio (1511–74), Italian writer, painter, and architect best known for his book on the lives of major Italian Renaissance artists.

Vasari was born on July 30, 1511, in Arezzo. Trained in art as a child, he went to Florence, where he worked in the studio of Andrea del Sarto and won the patronage of the Medici family. Among Vasari's major surviving paintings are murals in the Palazzo Vecchio, Florence, and the Vatican in Rome.

As an architect Vasari was a follower of his brilliant contemporary Michelangelo. Among the important buildings he designed are the Palazzo degli Uffizi in Florence, now a museum, and a number of palaces and churches in Pisa and Arezzo. It is as a writer, however, that he is most famous. His *Vite de' Più Eccellenti Pittori, Scultori, ed Architetti Italiani* (1550; revised 1568; Eng. trans., *Lives of the Artists*, 10 vol., 1912–14), one of the earliest works on art written by an artist of merit, is a primary source of information about the artists of the Italian Renaissance. The revised edition includes his autobiography in addition to the lives of Michelangelo and other major painters of the time. Vasari offers his personal evaluation of the works of these artists, as well as discussions on the state of the arts. He wrote in an easy, natural style that has helped to make his book one of the most enduring of art histories. He died in Florence on June 27, 1574.

VASCO DA GAMA. See GAMA, VASCO DA.

VASSAR COLLEGE, coeducational, nonsectarian privately controlled institution of higher learning, situated in Poughkeepsie, N.Y. The college was founded in 1861, as Vassar Female College, with a gift of funds and land from the American philanthropist Matthew Vassar (1792–1868); the present name was adopted in 1867. Courses in the liberal arts and sciences are offered leading to the degrees of B.A., M.A., and M.S. Among facilities of the college are a library containing 460,000 bound volumes and a valuable art collection. In 1972–73 enrollment totaled 2150 students and the faculty numbered 216. The endowment was about \$48,573,000.

VÄSTERÅS, city in Sweden, and capital of Västmanland County, on Västernär Bay, an arm of Lake Malar (Mälaren) at the mouth of the Svart R. (Svartån), 55 miles N.W. of Stockholm. A road and rail hub, the city is the center of the Swedish electrical industry and manufactures appliances, iron and steel, generators and motors, locomotives, glass, and lumber products. Of interest are a Gothic cathedral, built in 1271 on the site of an 11th-century church, which contains the tomb of Eric XIV, King of Sweden (1533–77); a reconstructed 12th-century castle once captured by Gustavus I (q.v.), King of Sweden; a noted episcopal library; a county folk museum; an industrial museum; and the Djäkneberget, a park containing statues of historical personages. A trade and cultural center in the Middle Ages, the city was originally called Aros; the name was changed to Västra (Vestra) Aros in 1271. In 1527 the parliament produced the Västerås Recess, which introduced the Reformation to Sweden and placed the church under the control of Gustavus I and the state. In 1544 the hereditary law of accession to the throne was adopted in the city. The name was also formerly spelled Vesterås or Westerås. Pop. (1971 est.) 118,065.

VATICAN CITY, independent papal state and territory of the Holy See of the Church of Rome, situated in Rome, Italy, and established in February, 1929, under the terms of the Lateran Treaty (q.v.), concluded by the Italian government and the papacy after many years of controversy. This treaty, which recognized the full sovereignty of the Holy See within the State of Vatican City, was incorporated into the Constitution of the Republic of Italy, promulgated in 1947.

Vatican City is situated on Vatican Hill in N.W. Rome, just west of the Tiber R. It has an area of 108.7 acres and is largely surrounded by medieval and Renaissance walls. It is governed by the



The Piazza di San Pietro in Vatican City is seen here from the 400-ft.-high dome of Saint Peter's Basilica. A red granite obelisk rises in the center of the colonnaded piazza.

Italian Government Travel Office

pope, in whom are vested absolute executive, legislative, and judicial powers. The executive powers are delegated to a governor, who is responsible directly to the pope. The judicial powers are exercised by tribunals; appeals from their decisions are heard by the Sacred Roman Rota and by the Supreme Tribunal of the Apostolic Signature. In the exercise of his legislative powers, the pope is advised and assisted by the Sacred College of Cardinals (see **CARDINAL**) and by the various Sacred Congregations. The Secretariat of State represents the Holy See in diplomatic relations with foreign powers.

Vatican City has its own railway station, radio facilities, postal system, and coinage. Its official journal is the *Acta Apostolicae Sedis* ("Events in the Holy See"), which is published monthly. Included within the area of Vatican City is the Piazza di San Pietro, which usually is open to the public and is subject to the authority of the Italian police. Thirteen buildings situated within Rome but located outside of Vatican City are endowed with extraterritoriality and are under the jurisdiction of the Holy See. Pop. (1970) about 1000.

For the history of the papal territories before 1929, see **PAPAL STATES**. A brief description of the noted buildings within the Holy See is presented in the article **VATICAN, PALACE OF THE**.

VATICAN COUNCILS, two ecumenical councils of the Roman Catholic Church (q.v.), held at Vatican City in Rome; see **COUNCIL**.

Vatican Council I. The first of these councils met (1869-70) 300 years after the end of the pre-

vious ecumenical council (see **TRENT, COUNCIL OF**). It was convoked by Pope Pius IX (see under **PIUS**). The principal accomplishment of Vatican Council I was the definition of papal infallibility; see **INFALLIBILITY**.

Vatican Council II. The second of these councils was convoked by Pope John XXIII (see under **JOHN**) on Oct. 11, 1962. The first session was attended by more than 2400 Roman Catholic bishops, a number of theologians and scriptural scholars, and some forty observers from other Christian churches. Thirty-six general working meetings were held in Saint Peter's Basilica (q.v.) under the revolving presidency of ten cardinals. During two months of deliberations, more than 1100 priests expressed their views in speeches and writings on five projects concerning the liturgy (q.v.), the sources of the New Testament book of Revelation (q.v.), mass-communications media, the unity of the church, and the nature of the church. Approval was voted on measures to render the liturgy more informative and on a proposal to develop the use of mass-communications media for the spread of Christian teaching.

The second session began Sept. 29, 1963, under Pope Paul VI (see under **PAUL**), who set forth its chief objectives: examination of the nature of the church, reform of the church, furtherance of Christian unity, and improvement of the dia-

VATICAN, PALACE OF THE

logue of the church with the contemporary world. The nature of the church, the collegiality of bishops, the establishment of a permanent diaconate (or office of deacon), and the role of the laity were discussed at length. At this session was voted and promulgated the *Constitution on the Sacred Liturgy*, which introduced among other reforms the use of the vernacular in worship services, and the *Decree on the Instruments of Social Communication*, which promoted the spread of Christian teaching through the use of mass-communications media.

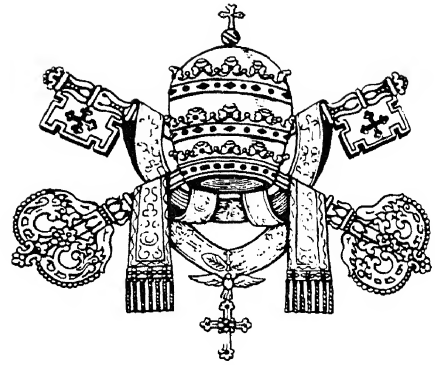
A third council session opened Sept. 14, 1964. The most important constitution voted and promulgated at this session was the *Dogmatic Constitution on the Church*, the outstanding features of which are the reinstatement of a permanent church diaconate, the affirmation of the collegiality of bishops, and a definition of the role of lay people in the church.

The fourth and final session of Vatican Council II opened Sept. 14, 1965. Among the declarations promulgated at this session was the *Declaration on the Relationship of the Church to Non-Christian Religions*, which emphasizes the importance of cooperation and understanding between the Roman Catholic Church and other religious bodies. The declaration is especially notable for its repudiation of collective Jewish guilt concerning the death of Christ; see also **ANTI-SEMITISM**. Also promulgated was the *Declaration on Religious Freedom*, which stated the belief of the Roman Catholic Church that every man be entitled to follow his conscience in matters of religion. Other council documents issued during the fourth session pertained to matters of clerical life, divine revelation, the role of bishops and the laity in the church, education, missionary activities, and the role of the church in the modern world. Vatican Council II closed officially on Dec. 8, 1965.

See also **ECUMENICAL MOVEMENT**. T.M.H.

VATICAN, PALACE OF THE, residence of the pope in Rome, located in the independent state of Vatican City (q.v.). The palace consists of a complex of buildings, containing more than 1000 rooms. It houses, in addition to the papal apartments, the government offices of the Roman Catholic Church (q.v.), several chapels and museums, and a library.

History. The first to construct a papal residence on the site, which formerly had been occupied by the gardens of the Roman emperor Nero, was Pope Symmachus in the 6th century. The present papal residence dates from the 13th century. It overlooks the colonnade of Saint Peter's Basilica (q.v.), which was executed by the



Crossed keys and tiara, a traditional Vatican seal.

sculptor and architect Giovanni Lorenzo Bernini. Bernini also created the *Scala Regia* (Lat., "royal staircase"), which leads to the Vatican Palace. Under the patronage of Renaissance popes, the Vatican Palace was decorated by some of the greatest Italian artists. In 1509 Pope Julius II commissioned the painter Raphael to decorate his private apartment, afterwards called Raphael's Rooms. In the same years (1508-12) the sculptor and painter Michelangelo painted the ceiling of the Sistine Chapel (q.v.), named after its builder Pope Sixtus IV; in 1536 he began the "Last Judgment" on the wall behind the altar of the chapel. The walls of the chapel are decorated with frescoes by the painters Sandro Botticelli, Domenico Ghirlandajo, Luca Signorelli, and others.

Contents. The palace houses valuable art and archeological collections in its several museums and library. Among the Vatican museums are the Gregorian Museum of Egyptian Art; the Gregorian Museum of Etruscan Art; the Museum Pio Clementino; and the Museum Chiaramonti. The contents of these museums include Egyptian coins and medals, Roman copies of Greek statuary, fragments of Roman frescoes, and Etruscan masterpieces. The *Pinacoteca* (Lat., "Picture Gallery"), which contains works by a representative group of Italian masters, was initiated by Pius VII; Pius XI commissioned the building of the New Picture Gallery in 1932. A museum of contemporary art opened in 1973. Nicholas V is considered the founder of the Vatican Library. The library, part of which is open to the public, has in its collection 60,000 priceless codices, 6000 incunabula (q.v.), and more than 500,000 volumes. Leon Battista Alberti and Bernardo Rossellino were among the architects of the library.

See separate biographies for persons mentioned.

VAUBAN, Marquis de, Sébastien Le Prestre.
See FORTIFICATION AND SIEGE CRAFT.

VAUDEVILLE, form of entertainment. The term dates from the 15th century and is supposed to refer to the place of origin, the valley of Vire (Middle Fr. *vau de Vire*) in France, of a type of satirical or humorous drinking song. By the 18th century the name had been corrupted to *voix de ville* or "street voices", and such songs were frequently inserted in spoken dramas. One form of vaudeville, a collection of songs arranged to accompany a dramatic sketch or an operatic parody, was roughly similar to the English ballad opera; see COMIC OPERA; OPERA.

In more recent times, vaudeville was used to refer to a kind of entertainment made up of several individual "acts" or presentations by a single entertainer or group of entertainers—acrobats, family acts, musicians, comedians, jugglers, magicians, trained animals, and so forth. This kind of vaudeville evolved both from British music-hall entertainment and, more directly, from barroom entertainment. The first person to transform it into respectable entertainment was the American actor and theater manager Tony Pastor (about 1837–1908), who in 1881 presented a variety show at his Fourteenth Street Theater in New York City. In 1885 Benjamin Franklin Keith (1846–1914) entered into partnership with Edward Franklin Albee (1857–1930), with whom during the ensuing half century he acquired control over a chain of vaudeville theaters in almost every major city of the United States. Largely as a result of the enterprising management of Keith, Albee, and Frederick Francis Proctor (1851?–1929), who joined them in 1905, vaudeville became the most popular form of American entertainment during the early decades of the 20th century.

In 1928, when vaudeville was at the height of its popularity, an estimated 2,000,000 people daily attended performances given at the approximately 1000 vaudeville theaters of the U.S. The Palace Theater in New York City was the leading theater on the so-called vaudeville circuit, and to appear there was the aspiration of almost every vaudeville performer. Star performers, or headliners, of vaudeville included the singers Nora Bayes (1880–1928) and Eva Tanguay (1878–1947) and the comedians Eddie Cantor and W. C. Fields (qq.v.). Not only American, but also foreign, performers appeared in American vaudeville houses. Among them were the Scottish singer-comedian Sir Harry Lauder (q.v.), the French singer Yvette Guilbert (1866–1944), and the French actress Sarah Bernhardt (q.v.). See also BURLESQUE; CIRCUS, MODERN.

The rise to popularity of motion pictures and radio, coupled with a variety of social and economic factors, led during the early 1930's to the rapid decline and virtual collapse of vaudeville, although vestiges of it persisted in revues and musical comedies and later on television. See also MUSICAL COMEDY; TELEVISION.

VAUGHAN WILLIAMS, Ralph (1872–1958), the most distinguished English composer of the 20th century, whose music established a British national musical style.

Born at Down Ampney on Oct. 12, 1872, Vaughan Williams was educated at Cambridge University and the Royal College of Music in London. His teachers included two British composers active in initiating the 20th-century revival of British music, Charles Hubert Hastings Parry (1848–1918) and Sir Charles Villiers Stanford (1852–1934). He also studied in Berlin in 1897–98 with the German composer Max Bruch (1838–1920) and in Paris in 1909 with the French composer Maurice Ravel, from whom he learned valuable skills in orchestration. From about 1903 he collected English folk songs, assimilating their rhythms, scales, and melodic contours into his own style. Also helping to form his style were English music of the 17th century and English hymnody. He served as music editor for the *English Hymnal* (1906), for which he wrote the well-known hymn tune *Sine nomine* ("without name") as a setting of the text "For all the saints", and also edited *Songs of Praise* (1925) and *The Oxford Book of Carols* (1928). Always deeply interested in the English choral tradition, he conducted local choruses at the Leith Hill Music Festival from 1909 to 1953 and wrote *Benedicite* ("Blessed Be"; 1930) and other choral works for such festivals. Vaughan Williams died Aug. 26, 1958, in London.

His nine symphonies include the *London* Symphony (1914; revised 1921) and the *Pastoral* Symphony (1922). The *Fantasia on a Theme of Thomas Tallis* (1909) is for double string orchestra. *Flos campi* ("Flower of the Field"; 1925), for solo viola, chorus, and small orchestra, evokes passages from the Song of Songs of the Bible. His stage works include *Job: A Masque for Dancing* (1931); a setting (1927) of *Riders to the Sea* by the Irish playwright J. M. Synge; and the ballad opera *Hugh the Drover* (1914).

VAULT, in architecture, arch-shaped structure, usually of masonry, used as the ceiling of a room or other enclosed space, as the roof of a building, or as the support for a ceiling or roof. Masonry vaults are usually composed of wedge-shaped pieces called voussoirs which are held in place, like the stones of an arch, by the pres-

VAULT

sure of the neighboring pieces. Because of the combined pressure of its components, any arch exerts an outward pressure at its base, and the base, therefore, must be so constructed as to withstand this outward thrust as well as the downward thrust of the arch. This construction can be accomplished by using strong, heavy walls to support the arch, by placing such walls adjoining each other so that the outward thrusts are balanced, or by supporting the walls with exterior structures or buttresses. The building of masonry vaults also requires the erection of a temporary supporting structure within the vaulted area during construction, because the vault does not become self-supporting until the central voussoirs or keystones are put in place.

Types of Vaults. Architecturally, a number of different types of vaults are recognized. The simplest of these is the barrel vault or tunnel vault, the roof of which is shaped like half of a cylinder and is supported by straight walls. The annular vault is similar to the barrel vault, except that the passage within it is not straight but curved, giving the entire structure the appearance of a portion of a ring. A groined vault is formed by the intersection of two vaults of the barrel type, usually at right angles to each other. The junctures at which the two vaults meet are elliptical ridges, called groins. In the simplest form of groined vault, the two conjoined vaults are of the same size and the floor of the vault is

square; if the vaults are of different sizes, however, the floor of the vault is rectangular and the two areas of the ceiling between the groins are of unequal shape and size. A special type of groined vault is the Welsh groin, in which one of the meeting vaults is higher than the other.

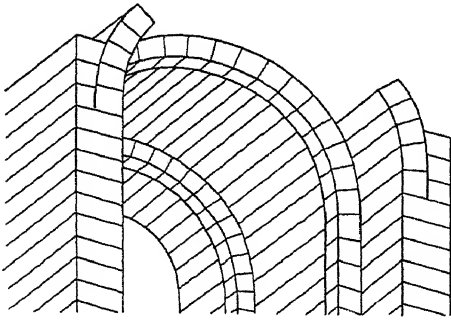
A dome (q.v.) is a spherical vault resting on a circular base wall. Pendentives are portions of spherical vaults placed in the corners of square or other polygonal structures to form a circular base for a dome above. More complicated vaults include ribbed vaults, in which the inner vault surface is subdivided by a number of independent supporting arches or ribs. Cloistered vaults, which are also formed by the intersection of two vaults at right angles, have surfaces so arranged that their junctures appear as depressions instead of ridges, as is the case with groined vaults.

See also ARCH; ARCHITECTURE: Greece and Rome; The Middle Ages; GOTHIC ARCHITECTURE; MOSLEM ART AND ARCHITECTURE; ROMANESQUE ART AND ARCHITECTURE; WINDOW.

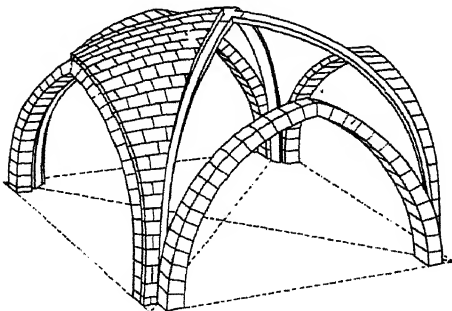
VEAL. See MEAT.

VEBLÉN, Thorstein Bunde (1857–1929), American economist and social scientist, born in Cato, Wis., and educated at Carleton College, in Northfield, Minn., and at Johns Hopkins, Yale, and Cornell universities. From 1892 to 1906 he taught political economy at the University of Chicago. He taught economics at Stanford University from 1906 to 1909 and at the University of Missouri from 1911 to 1918. He was on the staff of the New School for Social Research, in New York City, from 1919 to 1926, when he retired.

Veblen is notable for his historical investigation of the economic structure of society and for his analysis of the contemporary economic system. He described society as divided into a "predatory", or "leisure", class, which owns business enterprises, and an "industrious" class, which produces goods. He criticized businessmen for what he considered to be their pecuniary values. His most famous work, *The Theory of the Leisure Class* (1899), characterized the leisure class as parasitic and therefore harmful to the economy. In this work, he used the term "conspicuous consumption", later used in describing the competition for social status among Americans. Veblen maintained in other writings that the economic system of his day was based on price fluctuations and suggested that the inefficiency of the system be corrected by placing experts in charge of production and distribution. Throughout his work was an underlying concern with business enterprise and its power;



Types of vaults. Above: Barrel vault. Below: Groined vault.

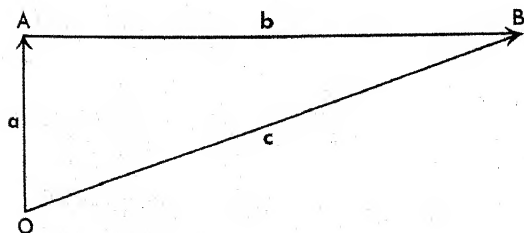


his ideas were influential on the development of economic policy and particularly on the policy trend toward more social control or governmental activity in the economy at a time when business enterprise dominated the economy. His writings include also *The Theory of Business Enterprise* (1904), *The Instinct of Workmanship* (1914), *The Place of Science in Modern Civilization* (1919), and *The Engineers and the Price System* (1921).

VECTOR, in mathematics, quantity having both magnitude and direction. For example, an ordinary quantity, or scalar, can be exemplified by the distance 3 miles; a vector quantity can be exemplified by the term 3 miles north. Vectors are usually represented by directed line segments, such as \overrightarrow{OB} in the diagram below; the length of the line segment is a measure of the vector quantity and its direction is the same as that of the vector.

The simplest use of vectors and calculation by means of vectors is illustrated in the diagram, which shows a boat moving across a stream. Vector a , or \overrightarrow{OA} , indicates the distance that the boat would travel in a given interval of time if it were moving through still water; vector b , or \overrightarrow{AB} , shows the drift or flow of the current during the same period of time. The actual path of travel of the boat under the influence of its own propulsion and of the current is represented by vector c , or \overrightarrow{OB} . By the use of vectors any type of problem involving the motion of an object being acted upon by several forces can be solved graphically.

This method of problem solution, known as vector addition, is performed as follows. A vector representing one force is drawn from the origin O in the proper direction. The length of the vector is made to agree with any convenient arbitrary scale, such as a given number of inches to the mile. In the diagram the rate of rowing was 3 m.p.h., the time rowed was 40 minutes, and the scale was $\frac{1}{3}$ in. to 1 mi. Therefore the line \overrightarrow{OA} is drawn as $\frac{2}{3}$ in. to equal 2 mi. The current speed of 6 m.p.h. is then represented by a vector that is $\frac{2}{3}$ of 2 in. or $1\frac{1}{3}$ in. long, indicating a distance of 4 mi. that the current moved during 40 minutes. This second vector is drawn



with its origin at the end of vector a in a direction parallel to the flow of the current. The point B at the end of the second vector represents the actual position of the boat at the end of 40 minutes travel, and the actual distance traveled is represented by the length (in this case, about 4.47 mi.) of the vector c , or \overrightarrow{OB} .

Problems in vector addition and subtraction such as the one above can be easily solved by graphical methods, and can also be calculated by means of trigonometry. This type of calculation is useful in solving problems in navigation and motion as well as in mechanics and other branches of physics. In present-day advanced mathematics, a vector is considered an ordered set of quantities with appropriate rules of manipulation. Vector analysis, that is, the algebra, geometry, and calculus of vector quantities, enters into the applied mathematics of every field of science and engineering.

See ALGEBRA; ANALYTICAL GEOMETRY; CALCULUS.

J.Si.

VEDA (Skr., "knowledge"), designation of a body of the most ancient sacred literature of Hinduism (q.v.), or of individual books belonging to that literature. This body of ancient literature consists primarily of four collections of hymns, detached poetical portions, and ceremonial formulas. The four collections are called the *Rig-Veda*, the *Sama-Veda*, the *Yajur-Veda*, and the *Atharva-Veda*. They are known also as the Samhitas (roughly "collection").

Origins and Transmission. The four Vedas were composed in Vedic, an early form of Sanskrit; see SANSKRIT LANGUAGE. The oldest portions are believed by scholars to have originated largely with the Aryan invaders of India some time between the 11th and 9th centuries B.C.; however, the Vedas in their present form are believed to date only from the close of the 3rd century B.C. For much of the time prior to the writing down of the present texts, rishis, or sages, transmitted the Vedic matter orally, changing and elaborating it in the process. But large masses of material probably taken from the original Aryan milieu or absorbed from the Dravidian culture of India were preserved and are distinguishable in the texts.

Contents and Use. The first three Samhitas are primarily ritual handbooks, which were used in the Vedic period by three classes of priests that officiated at ceremonial sacrifices. The *Rig-Veda* contains over 1000 hymns (Skr. *rig*), composed in various poetic meters and arranged in ten books. It was used by the *hotri*, or reciters, who invoked the gods by reading its hymns aloud. The *Sama-Veda* contains verse portions taken

mainly from the *Rig-Veda*. It was used by the *udgatri*, or chanters, who sang its hymns, or melodies (Skr. *sama*). The *Yajur-Veda*, which now consists of two recensions, both of them partly in prose and partly in verse and both containing roughly the same material (although differently arranged), contains sacrificial formulas (Skr. *yaja*, "sacrifices"). It was used by the *adhvaryu*, priests who recited appropriate formulas from the *Yajur-Veda* while actually performing the sacrificial actions.

The fourth Veda, the *Atharva-Veda* (in part attributed by tradition to a rishi named Atharvan) consists almost exclusively of a wide variety of hymns, magical incantations, and magical spells. Largely for personal, domestic use, it was not originally accepted as authoritative because of the deviant nature of its contents. Scholars believe that it dates from a later time, and that it may have been derived mainly from the remnant of the indigenous pre-Aryan culture. Eventually it was acknowledged as one of the Vedas, especially after its adoption as a ritual handbook by the Brahmins (see *BRAHMAN*), a fourth, and the highest, class of priests officiating at the sacrifices.

Supplementary Writings. Strictly speaking, the Vedas include the Brahmanas and the mantras. The former are prose commentaries attached to each of the four Vedas and are concerned principally with the details and the interpretation of the sacrificial liturgy (q.v.). The latter are the poetic stanzas (or *Samhitas*) of the four Vedas, mantra being the term used specifically for the four verse collections. The mantras are regarded by some scholars as the oldest part of the Vedas.

Supplementary to the Brahmanas are later esoteric works known as forest treatises (Skr. *Aranyakas*; from *aranya*, "forest"). The *Aranyakas* were expounded and written by Brahman sages in forests because it was felt that a proper understanding of them could be achieved only in seclusion. The final portions of the *Aranyakas* are called *Upanishads* (q.v.). Profound metaphysical and speculative works closely connected with the Brahmanas, they emphasize knowledge and meditation and are the first attempts in Hinduism at a systematic treatment of speculative thought. *Vedanta* (q.v.) and most other Indian philosophical systems later developed from the *Upanishads*.

The latest products of the Vedic period are the *sutras* (Skr. *sutra*, literally "thread", roughly, "string of rules"). Collections of aphorisms elaborating and dissertating on the Vedic sacrifices, domestic ceremonies (such as marriage

and funeral rituals), and religious and secular law, the *sutras* are significant for their influence on the development of Hindu law. As works of authority, however, they are not as highly regarded as the Vedas, Brahmanas, and *Upanishads*. The latter, especially the Vedas, are revered as *apaurusheya* (Skr., "not of human origin").

See also *INDIAN MYTHOLOGY*; *SANSKRIT LITERATURE*.

VEDANTA (Skr. *veda*, "knowledge"; *anta*, "end"), one of the six orthodox philosophies of Hinduism (q.v.). *Vedanta*, based on the speculative portion of late Vedic literature, primarily the treatises known as *Aranyakas* and *Upanishads* (q.v.), is chiefly concerned with knowledge of Brahman (q.v.), the universal supreme pure being; see *VEDA*.

Differing Indian traditions ascribe the first truly Vedantic manuals, the *Vedanta-sutras* (also called *Brahma-sutras*), to two semilegendary figures; the philosopher Badarayana (about 1st cent. A.D.), and a vaguely identifiable sage named Vyasa. To the latter these same traditions also ascribe definitive compilations of the Vedas, as well as a compilation of the later epic poem *Mahabharata* (q.v.). Most modern scholars, without completely rejecting the traditions, point out that the Sanskrit name Vyasa, meaning "arranger" or "collector", has been applied to many ancient Hindu authors and compilers.

Whoever first formulated the *Vedanta* set down its teachings in aphorisms so pithy that they are virtually unintelligible without the aid of interpretation; and different interpretations of the *Vedanta-sutras* have subsequently given rise to numerous schools of Indian philosophy, the most important being Advaita, or nondualism, founded by the Hindu philosopher and theologian Shankaracharya, or Sankara (788?-820?); see *DUALISM*; *MONISM*.

Sankara. The central problem in Sankara's system of interpretation is the nature of the relation between Brahman and Atman, the individual self, breath, or soul (q.v.). According to Sankara, the two are identical. The individual self, however, is prevented by *avidya*, or ignorance, from understanding the nondual universal nature of pure being (Brahman). Thus it perceives only separate selves and things (that is, the whole world of material, temporal existence), and never realizes that all separate existences are essentially unreal (these being phenomena produced by *maya*, the power of illusion mysteriously inherent in and projected from Brahman). So long as the individual self remains without real knowledge, it will blindly

look for its true self in the phenomenal world. It remains enmeshed in that world, again and again experiencing samsara, or the series of existences, deaths, and rebirths each unenlightened soul undergoes as a consequence of its karma (its good and evil actions in past existences, which determine the form of future existences); see TRANSMIGRATION. Through the proper knowledge of Vedanta, however, the individual soul recognizes the limitless reality forever existing behind the cosmic veil of Maya, realizes that its own true nature is identical with Brahman, and through this self-realization achieves moksha (release from samsara and karma) and Nirvana (q.v.).

Later Interpreters. Later modifications of this philosophy were introduced by the philosophers Ramanuja (d. 1137 A.D.) and Madhva (1199?-1278?). In modern times, the philosophy has received attention outside India through the work of Vivekananda (1863-1902), the Indian interpreter of the work of the Hindu mystic Ramakrishna (1836-86). In the United States, for example, in the late 1960's some 1500 members were claimed by the Vedanta Society of America, affiliated with a group with international headquarters at Belur Math, the Ramakrishna Mission chapel near Calcutta, India. See INDIAN RELIGIONS.

VEGA, first-magnitude star of the constellation Lyra (q.v.) and the brightest star in the heavens of the Northern Hemisphere. It glows with a distinct bluish tinge, and is estimated to be the fourth brightest star in the sky. Vega is approximately 26 light-years from earth, and is the dominant celestial body in the vicinity of the solar apex, that point in the sky toward which the sun and solar system are moving.

VEGA, Lope de, in full LOPE FÉLIX DE VEGA CARPIO (1562-1635), Spanish playwright and poet, born in Madrid and educated at the University of Alcalá de Henares. He was a soldier in the Azores campaign of 1583 and in 1588 served in the Armada (q.v.), having been banished from Madrid earlier that year on a charge of libel resulting from an imprudent love affair. In 1614, following the death of his second wife, Lope de Vega became a priest. He continued, however, his life-style, literary and personal, and amassed great wealth and fame.

Lope de Vega is considered the founder of the Spanish national drama. His biographer Juan Pérez de Montalván (1602-38) attributes more than 2000 plays (*comedias*), including about 400 religious pieces (*autos sacramentales*), directly to his hand. The plays are divided into three acts and are usually characterized by love as a moti-

vating factor and the rapid solution of plot complications very near the end of the drama. The works are thought to suffer, however, from a lack of individuality in character portrayal. Typical specimens of Lope de Vega's work include *Noche de San Juan* ("St. John's Eve"), one of his last plays; *Maestro de Danzar* ("Dance Teacher"), one of his first; and *El Acero de Madrid* ("The Steel of Madrid", about 1613), the source clearly of *Le Médecin Malgré Lui* ("The Doctor in Spite of Himself", 1666) by the French dramatist Molière (q.v.). Some of Lope de Vega's plays are still performed, especially *Fuenteovejuna* (1612-14?; Eng. trans., "Fuenteovejuna", 1961), *Peribáñez y el Comendador de Ocaña* (1614-16; Eng. trans., *Peribáñez*, 1961), *La Dama Boba* ("The Foolish Lady", 1613), and *El Caballero de Olmedo* (1620-25; Eng. trans., "The Knight of Olmedo", 1961).

See also SPANISH LITERATURE: *Renaissance and Golden Age*.

VEGETABLE, name popularly applied to any plant or plant organ, but commonly restricted to edible plants or plant organs. Defined in this latter way, vegetables include roots such as potatoes, stems such as celery, leaves such as lettuce, flowers such as capers, fruits such as tomatoes, and seeds such as peas. In cookery any edible plant organs, including fruits, usually served as part of the main course of a meal are referred to as vegetables; and the term "fruit" is restricted to those served as desserts, especially the sweet, succulent fruits of trees; see FRUIT. See also HORTICULTURE.

VEGETABLE IVORY. See IVORY PALM.

VEGETABLE MARROW, variety of the pumpkin (q.v.), *Cucurbita pepo*, var. *medullosa*. It is pale greenish-yellow in color, oval, ribbed, and about 9 in. long, with a soft, fine-grained flesh. See SQUASH.

VEGETABLE OIL, any of various natural oils obtained from plants, particularly a fatty oil derived from seeds or fruit, which are used in industry, medicine, and food products; see FATS AND FIXED OILS. Among the most common vegetable oils are coconut, corn, safflower, soybean (qq.v.), and linseed oil; see FLAX. See also CASTOR OIL.

VEGETABLE OYSTER. See SALSIFY.

VEGETABLE TALLOW. See TALLOW TREE.

VEGETARIANISM, belief in and practice of eating foods obtained exclusively from the vegetable (q.v.) kingdom, and hence of abstaining from meat (q.v.) and other animal foods. Non-vegetable food is usually considered by vegetarians to include flesh, fowl, or fish, but practice varies.

VEGETATION

Vegetarianism is an ancient practice. It has long existed among certain sects of Hinduism and Buddhism (qq.v.) that hold all animal life to be sacred (see **SACRIFICE**), and was advocated by numerous philosophers and writers of ancient Greece and Rome. In the Roman Catholic Church, it has been practiced monastically by Trappists (q.v.) since 1666, and among Protestants more recently by members of the Seventh-Day Adventist Church (q.v.). As an active Western movement, it originated in 1809 near Manchester, England, when members of the Bible Christian Church pledged themselves to a meatless diet. In 1847 the Vegetarian Society, a non-religious organization, was founded. The movement spread to Continental Europe and the United States (1850), and in 1908 the International Vegetarian Union was founded. Today the union holds congresses every two years in different countries.

Vegetarian Arguments. Although vegetarianism originated as a religious or ethical practice, it has also gained acceptance among many for aesthetic, nutritional, and economic reasons. Humanitarian vegetarians refuse meat because they feel that the killing of animals is unnecessary or cruel, or such a practice can conceivably lead to a disregard for human life; the trades the slaughter of animals supports, such as butchering, are considered degrading. People who adhere to vegetarianism for health reasons believe that meat is harmful to the human body and that a purely vegetable diet is more nutritious; see **DISEASES OF ANIMALS**. Because a meatless diet might result in a protein (q.v.) deficiency, vegetarians try to satisfy their protein needs from corn and the seeds of legumes.

Dietary Strictness. The strictness of diet also varies among vegetarians. Purist vegetarians, known as Vegans, reject all foods derived from animals, including dairy products such as eggs, milk, cheese, and butter. Other vegetarians abstain only from foods whose production involves the destruction of living animals; see **ANIMALS, CRUELTY TO**; **PACKING INDUSTRY**. Moderate practitioners allow themselves foods that are procurable without what they deem to cause unnecessary suffering or pain, for example, net-caught fish. Most vegetarians, preferring food in its most natural state, oppose the use of both agricultural chemicals and of food processing or canning (q.v.); see **AGRICULTURAL CHEMISTRY**; **FOOD PRESERVATION**.

See also **CANNIBALISM**; **FOOD**; **NUTRITION, HUMAN**.
VEGETATION. See **GRASSES**; **PLANT**; **PLANTS, GEOGRAPHICAL DISTRIBUTION OF**. See also **BOTANY**; **PLANT MORPHOLOGY**; **PLANT PHYSIOLOGY**.

VEII, ancient city of Etruria (q.v.), N.W. of Rome. Constantly at war with Rome, it was captured by the Roman army under Marcus Furius Camillus (q.v.) in 396 B.C. Ruins of Veii are near Isola Farnese, a suburb of Rome.

VEIN, in anatomy, blood vessel that conducts the venous (or blue) blood from the capillaries back to the heart. The exceptions to this description are the pulmonary veins, which return the red, oxygenated blood from the lungs to the heart; the portal veins, which receive the blood from the pyloric, gastric, cystic, superior mesenteric, and splenic veins and, entering the liver, break up into small branches that pass through all parts of that organ; and the umbilical veins, which convey the blood from the fetus to the mother's placenta. The veins enlarge as they proceed, gathering blood from their tributaries, and finally pour it through the ascending and descending venae cavae into the right auricle of the heart. Their coats are similar to those of the arteries, but much thinner, and often transparent. See **CIRCULATION OF THE BLOOD**; **HEART**.

VEIN, in geology, a tabular mass of mineral matter, deposited in the fissure, crack, or crevice of a body of rock, and differing in composition from the substance in which it is embedded. Most veins are the result of the gradual precipitation of substances, which were carried by underground waters or gases after the formation of the enclosing material. Veins vary in size from tiny streaks, which may be entirely contained in a small rock specimen, to masses thousands of feet in extent. When they occur in closely spaced stratified layers, the formation is known as a lode. Many metals and other valuable minerals occur in veins of igneous and sedimentary rocks (qq.v.). Within a vein the ore may follow certain streaks, known as shoots, or be restricted to pockets of extreme richness. The nonvaluable minerals associated with the ore in a vein are called gangue. The metallic minerals found in veins are most commonly in the form of oxides, sulfides, sulfates, carbonates, silicates, or other salts of metallic elements. Certain elements such as gold and platinum (qq.v.), however, usually occur as pure metals. In California gold is often found in veins of quartz (q.v.), the most common gangue mineral. Other common gangue minerals are barite, calcite, dolomite, feldspar, fluorite (qq.v.), and hornblende. See **GEOLOGY, ECONOMIC**.

VELÁSQUEZ, Diego or **VELÁZQUEZ, Diego** (1465?-1524?), Spanish soldier and colonial administrator, born in Cuéllar. In 1493 he accompanied the Italian-born navigator Christopher Columbus (q.v.) on his second voyage to the

New World and participated in the conquest of Hispaniola. In 1511 he was sent by Diego Columbus, the explorer's son, to conquer Cuba. Velázquez conquered the entire island by 1514 and soon thereafter severed connections with Diego Columbus, declaring himself governor of Cuba. Among the many towns founded by Velázquez were Baracoa, Havana, and Santiago de Cuba. In 1517 he organized the expedition that conquered Yucatán and in 1519 he sent the Spanish adventurer Hernando Cortes (q.v.) to conquer Mexico. The following year he ordered Cortes to return. When Cortes refused, he sent an expedition to arrest him; Cortes defeated the expedition in Mexico and won it to his own cause.

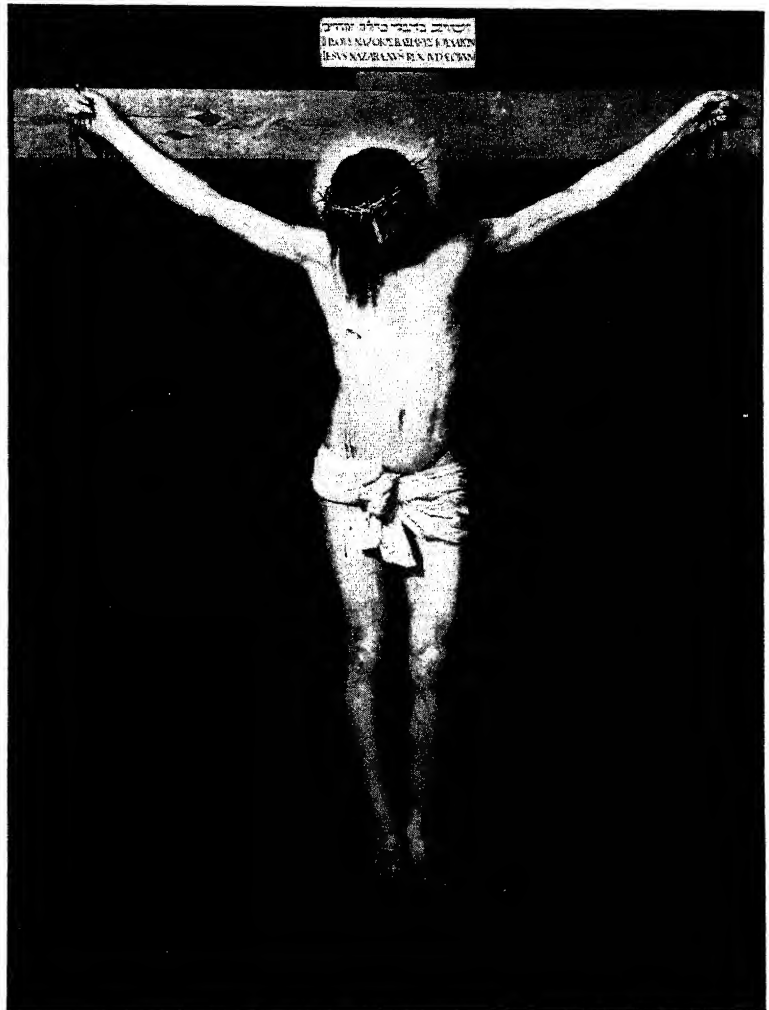
VELÁZQUEZ, Diego Rodríguez de Silva y or VELÁSQUEZ, Diego Rodríguez de Silva y (1599–1660), Spanish painter, born in Seville. At

the age of twelve he was apprenticed to the Spanish portraitist Francisco Pacheco (1564?–1654), in whose studio at Seville he remained for six years. In 1622, having been married for four years to Pacheco's daughter Juana, Velázquez visited Madrid. In 1623 he was appointed court painter to Philip IV (q.v.), King of Spain. A favorite of the king, Velázquez received other court appointments and in 1658 King Philip made him a Knight of the Order of Santiago. Meanwhile Velázquez had made two trips to Italy, remaining there from 1629 to 1631 and from 1648 to 1651, painting and studying the paintings of the Italian masters.

Velázquez' remarkable career ranges through several distinct periods. In Seville he painted strictly classical works in the baroque (q.v.) style, heavy in pigment and primitive in light and dark contrast. "Old Woman Frying Eggs"

"Christ on the Cross", painting by Velázquez. A product of the third phase of the artist's career, it was painted in the 1630's, some time after Velázquez had returned from Italy. At that time he began to use brighter colors and darker shadows.

Museo del Prado





"Portrait of Juan de Pareja" (1649) by Velázquez. The portrait of a young West Indian who was a pupil and servant of Velázquez was acquired by the Metropolitan Museum of Art in New York City, for \$5,500,000.

Wide World

(1618, National Gallery of Scotland, Edinburgh) is an example of this early period. In Madrid Velázquez was primarily concerned with producing portraits of the king and the members of his court, one of which, the formal study "The Conde-Duque of Olivares" (1624, Metropolitan Museum of Art, New York City), exhibits the artist's increasing concern with more subtle *chiaroscuro* (q.v.). During his first trip to Italy he painted several anecdotal pictures, including "The Forge of Vulcan" (1630, Prado, Madrid); these seem fluid in color and more concerned with unity of mood and atmosphere than his previous work. Following his return to Madrid Velázquez painted a varied and lively series of portraits of nobles, dwarfs, and buffoons, as well as the well-known historical scene "The Surrender of Breda" (1635, Prado). A portrait of King Philip, the "Fraga Philip" (1644, Frick Collection, New York City), shows his total abandonment of the baroque in favor of an open lucidity that forecasts 19th-century impressionism (q.v.).

Three important canvases date from Velázquez' second trip to Italy. These are "Juan de Pareja" (1650), purchased in 1971 by the Metropolitan Museum of Art in New York City for \$5,500,000; "Portrait of Innocent X" (1650, Doria Gallery, Rome); and the "Rokeby Venus" (1650?, National Gallery, London), the artist's only female nude. These and the canvases, most notably "The Maids of Honor" (1656, Prado), he pro-

duced during the last years of his life in Madrid are remarkable for their dramatic construction, their use of clarity to establish focus, and their balanced planar rather than linear perspective. One of the greatest gifts of Velázquez was his ability to infuse his canvases with life, although his subjects were often stilted formal portraits. **VELLORE**, city of the Republic of India, in Tamil Nadu State, on the Palar R., about 80 miles s.w. of the city of Madras. Vellore is a center of flower-growing and of trade in agricultural products. The chief point of interest is an ancient fort, an outstanding example of Indian military architecture, which was held for two years (1780–82) by British forces under siege by the maharaja Haidar Ali (1722–82). The fort encloses a Hindu temple noted for its magnificent sculptures. Pop. (1971) 138,220.

VELLUM. See PARCHMENT AND VELLUM.

VELOCIPEDE. See BICYCLE.

VELOCITY, in physics, rate of linear motion of a body in a particular direction. It is usually expressed in terms of distance covered and the time taken, such as ft. per sec., or mi. per hr. Velocity can be constant, or uniform, or it can be accelerated. Uniform velocity can be determined simply by dividing the distance covered by the time taken to travel. In accelerated velocity, the rate of motion increases per unit of time, and is expressed in terms of feet or miles per sec. per sec. A decreasing velocity is known as negative acceleration; see ACCELERATION. See also RELATIVITY.

VENDETTA, practice of a family taking vengeance upon the person who shed the blood of one of its relatives. Vengeance is taken in kind, that is, an eye for an eye, and may also be taken upon one of the offender's relatives. An established institution in many primitive cultures, the vendetta served to punish crimes in societies where governments did not yet exist or where they were greatly distrusted. It was practiced particularly in Corsica and in Sicily, where it was part of the code of the secret society of the Mafia (q.v.). A form of vendetta used to be common in certain areas of the southern United States, where it was known as feud (q.v.).

VENDING MACHINE, coin-operated automatic dispensing machine for cigarettes, candy, soft drinks, ice cream, or other small consumer goods. In some units, such as cigarette or candy machines, pulling the correct selector rod releases the package into an access slot. Other machines, especially those dispensing food, have small compartments, the door flaps of which can be opened after the correct amount of money has been inserted and accepted. The

dispenser is usually triggered by a complicated linkage system which is normally locked by a pin. This pin is displaced by the correct number of coins, thus permitting the selector rod to travel the full distance and actuate the linkage. In electric vending machines the linkage may be replaced by a series of switches which are actuated through a coin-triggered microswitch. When a specific selection is made, a locking mechanism prevents the simultaneous operation of the other selectors.

Coin Tester. An important feature of such automatic machines is the coin tester which rejects counterfeit or defective coins before they can enter the release compartment. The size of the coin slot limits the size of the coins which can be inserted. The coins normally roll down a chute to a checking system for weight, diameter, and thickness. In many machines the coin then rolls down an incline past a strong permanent magnet, where its speed is correctly retarded by the magnetic field if it is of the correct alloy composition. If the coin also has the right mass, it will have just the right amount of kinetic energy (q.v.) to rebound from a plate and to jump over a final rejection pin before proceeding to the release mechanism. A coin found to be irregular at any stage of the testing procedure is rejected and discharged through a return slot.

See also AUTOMATION.

VENEER, thin pieces of richly grained or colored woods, glued in sheets or numerous tiny pieces to the surfaces of inferior woods. Veneering makes the use of many beautiful and expensive tropical woods feasible because a great number of sheets of veneer may be derived from a piece of wood that would serve for only a single structural board; some veneers are cut as thin as an ordinary sheet of paper. The most common method of cutting veneers in the United States is to rotate the block of wood against a stationary knife after the wood has been thoroughly steamed or soaked in water. Ordinary sawing is also employed. After cutting, veneers are pressed flat and dried. Veneer may be applied in large sheets, as on flat surfaces of walls, furniture, or the outer woodwork of most pianos. Veneering applied in small pieces of equal thickness over a surface to form a decorative design is known as marquetry. The principle of veneering is used in the construction of plywood, which is made by gluing together three or more layers of veneer; the grain of each layer is set at right angles to the grains of the adjoining layers, thus affording great tensile strength and resistance to warping. See FURNITURE; WOOD.

VENEREAL DISEASES. See GONORRHEA; SYPHILIS. **VENETI,** ancient tribe of northern Italy. The Roman historian Cornelius Tacitus (q.v.) mentions a Venedi or Veneti tribe living on the south shore of the Baltic Sea who are identical with the modern Wends (q.v.). The German historian Theodor Mommsen (q.v.), however, classes the Veneti as coming from Illyria or perhaps Albania (qq.v.). The Veneti gradually came under Roman rule, probably during the 2nd century B.C. In 452 A.D. Attila (q.v.), King of the Huns (q.v.), destroyed many of their cities. Refugees found homes on the small islands in the lagoons that border the northwest coast of the Adriatic Sea. The settlements on these islands united to form the city of Venice. See VENICE: *History*.

VENETIA (It., *Veneto*), region of Italy, in the N.E. part of the country and divided into the provinces of Belluno, Padua, Rovigo, Treviso, Venice, Verona, and Vicenza, all named after their chief cities. Venetia is made up of two distinct topographical areas. They are the mountain ranges of the Carnic Alps and Dolomite Alps in the N. and the Venetian Plain in the S. connected by some hilly terrain. Among the many rivers that drain the plain are the Po, Adige, and Piave, the mouths of which form coastal lagoons along the Adriatic Sea. Agriculture, including the cultivation of cereals, vines, hemp, vegetables, and fruit, and livestock raising, lumbering, and fishing are important economic activities. Tourism is prevalent around the mountain resorts and Venice (q.v.). The development of hydroelectricity has encouraged the growth of manufacturing.

The region takes its name from the Veneti (q.v.), an ancient people conquered by the Romans in the 2nd century B.C. The Romans organized the area as the colony of Aquileia (q.v.). Long subject to barbarian invasions, it was not until the 10th century A.D. that important towns and, later, free communes developed. Venice came to dominate much of the surrounding area in the 15th century. From the late 18th century until 1866, when it joined the kingdom of Italy (q.v.), Venetia was under Austrian and French control. The province of Udine was detached from Venetia after World War II to form the region of Friuli-Venezia Giulia (q.v.).

Area, 7095 sq.mi.; pop. (1971) 4,109,787.

VENETIAN SCHOOL OF PAINTING, in art history, the sumptuous style of Renaissance painting that flourished in and near Venice, Italy during the 15th and 16th centuries. Paintings of the school are characteristically worldly and humanistic, treating both religious and pagan or



Venetian School of Painting. Plate 1. The painters of this school, which flourished in Venice and the surrounding region during the 15th and 16th centuries, are known for the rich and sensuous treatment they gave their subjects. Above: "The Sacrifice of Isaac", by Paolo Veronese, now in the Prado, Madrid.

Scala

"Saint Francis in Ecstasy", one of the most celebrated religious works of Giovanni Bellini, painted near the end of the 15th century. The leading painter of his day in Venice, Bellini created pictures noteworthy for their sensitive portrayal of personality, attention to the details of nature, and sumptuous coloring.

Frick Collection,
New York City



classical subjects in a sensuous, Romantic manner (see ROMANTICISM). They are contrasted with those of the austere Sienese school and with more naturalistic and monumental Florentine painting and sculpture (qq.v.). Richness of color was paramount in Venetian oil technique. Idyllic landscapes with elaborate composition and a soft, glowing sense of atmosphere are typical of the school, with later works exhibiting more splendor and dramatic movement; see MANNERISM. Among the major Venetian painters were Giovanni Bellini (see under BELLINI), Il Giorgione, Titian, Il Tintoretto, and Paolo Veronese (qq.v.).

See ART: *Italian Renaissance Art; Mannerist Art; ITALIAN ART AND ARCHITECTURE: Painting; RENAISSANCE ART AND ARCHITECTURE: Italy.*

VENEZUELA, GULF OF, formerly GULF OF MARACAIBO, inlet of the Caribbean Sea, on the coast of Venezuela, extending from the peninsulas of Paraguana and Guajira to the strait by which it is connected with the Lake of Maracaibo. The gulf is about 150 mi. wide and about 75 mi. long.

VENEZUELA, REPUBLIC OF, country of South America bounded on the N. by the Caribbean Sea and Atlantic Ocean, on the E. by Guyana (formerly British Guiana), on the S. by Brazil, and on the W. by Colombia. The country is situated between lat. $0^{\circ}45'$ N. and lat. $12^{\circ}12'$ N. and long. $59^{\circ}45'$ W. and long. $73^{\circ}09'$ W.

The coastline of Venezuela is about 1700 mi. long, and has numerous indentations, of which the gulfs of Venezuela and Paria are the most important. Except in the W., which has expanses of low and occasionally marshy land, the coast is generally narrow and steep. Of the seventy-two islands (total area, 14,633 sq.mi.) off the coast that belong to Venezuela, Margarita is the largest (444 sq.mi.) and most important. The total area of the country is 352,143 sq.mi.

THE LAND

The country has four distinct geographic regions. In the N.W. and N. are the Venezuelan highlands. The Maracaibo lowlands, containing Lake Maracaibo, an inland extension of the Gulf of Venezuela, are near the N.W. coast. The llanos, a region of tropical grassland, are in the N. central region; and the Guiana Highlands, which reach an elevation of more than 8000 ft. above sea level, in the S.E. and S. The mountains belong, topographically, to Guyana; they extend S.E. and S. from the delta of the Orinoco River (q.v.) into Brazil and Guyana, and are varied by open areas and forest. The chief ranges are the Sierra Parima and Sierra Pacaraima, which form part of the boundary with Brazil. Venezuela has six navigable rivers. Of the thousand or more streams in the country, the majority are affluents of the Orinoco, which, with the Apure, Meta, and Negro tributaries, forms the outlet into the Atlantic Ocean for the interior of Colombia, as

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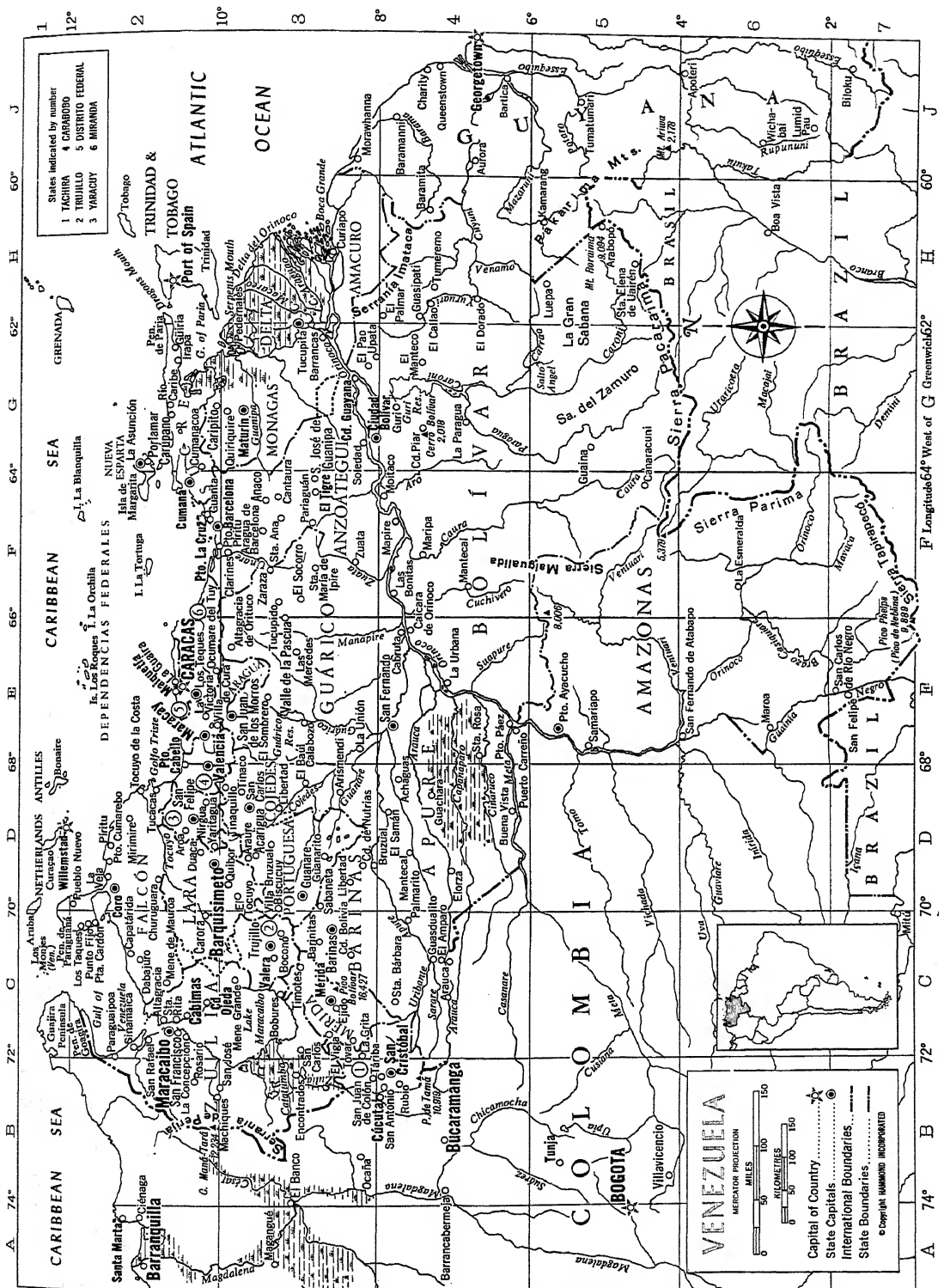
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well as Venezuela. The Orinoco extends eastward across central Venezuela and drains approximately four fifths of the total area of the country.

Climate. The climate of Venezuela is tropical on the llanos and along the coast, and temperate in the mountainous regions. The mean an-

nual temperature is 81° F. in La Guaira on the N. coast; 70° F. in nearby Caracas, which is 3025 ft. above sea level; and 61° F. in Mérida, in the west, which is 5400 ft. above sea level. The period between May and November is rainy.

Natural Resources. Venezuela is rich in mineral resources, notably petroleum, gold, iron





Caracas, in a mountain valley in northern Venezuela, is the country's capital as well as its largest city.

Steve Allen-Peter Arnold



Angel Falls, in southeastern Venezuela, highest waterfall in the world. Its waters plunge 3212 ft. to the bottom.

Luis Villota-Photo Researchers

ore, and diamonds. Forests, too, are an important resource, covering about 40 percent of the land.

Plants and Animals. Forests of varied species including palms, coral, mangoes, and brazilwood cover about half of the country. Plant life common to the Temperate Zone thrives above 3000 ft. Long grass grows on the llanos, and mangrove swamps cover much of the delta of the Orinoco R.

Among the animals are jaguars, monkeys, sloths, anteaters, ocelots, bears, deer, and armadillos. Bird life is abundant and includes the flamingo, heron, ibis, the guarcharo or oil bird (a bird of prey), and numerous other species. Reptiles including crocodiles and such large snakes as anacondas and boa constrictors are found in Venezuela.

Waterpower. The government is carrying out an intensive electrification plan aimed at increasing production in small towns and rural areas. The largest power project in the country is the privately constructed Guri Dam on the Caroní R.; construction of the power plant was begun in 1964, and its output was scheduled to reach approximately 6,000,000 kw annually. In the early 1970's total Venezuelan output of

electricity was estimated at about 14,000,000,000 kw hours.

THE PEOPLE

About 70 percent of the population of Venezuela is made up of mestizos (persons of mixed blood); and some 20 percent is European. The remainder is predominantly Negro, and a small percentage is Indian. The society is mainly urban. Spanish is the official language of the country. The principal religion is Roman Catholicism.

Population. The population (census 1971) was 10,721,522. The United Nations estimated the population density at about 29 persons per sq.mi. in 1970. About 80 percent of the population lives in the northern highlands or coastal regions. Only about 3 percent inhabits the huge area (nearly 50 percent of the total land area) south of the Orinoco R.

Political Divisions. The country is divided into twenty autonomous and politically equal States; two Federal Territories; the Federal Dependencies, which comprise seventy-two islands in the Caribbean; and the Federal District, site of Caracas, the national capital.

Principal Cities. Caracas (pop. 1971, 2,183,935) is the financial and commercial center of Vene-

zuela. The nearby town of La Guaira (300,000 including suburbs) serves as the seaport for the capital. Maracaibo, the second-largest city (650,002), located on the shores of Lake Maracaibo, is the center of the petroleum industry. Barquisimeto (334,333) is the hub of several important highways as well as a major railroad terminal.

Education. Education is free and compulsory for children between the ages of seven and fourteen. The literacy rate in the late 1960's was about 80 percent. The 10,700 elementary schools had a total enrollment of some 1,680,000 and were staffed by more than 50,000 teachers in the late 1960's; and some 900 secondary and technical schools had a combined enrollment of about 448,000 students.

Institutions of higher learning include the University de Los Andes at Mérida, the Central University at Caracas, and the University of Zulia at Maracaibo, all of which receive between 1 and 2 percent of the national income for financial support; and the Worker's University at Caracas, which was established by law in 1947. Total university enrollment was some 75,000 students annually in the late 1960's.

Culture. The dominant influence on the culture of Venezuela was that of the Spanish conquerors. The Indians of the country, lacking any political or cultural unity of their own, were assimilated by the immigrant groups and had only a slight influence on the national culture.

The distinct Venezuelan contribution to folk legend is the *llanero*, or South American cowboy. The national dance, the *bropo*, and such popular instruments as the *maraco*, a small harp,

and the *cuatro*, a small guitar, are all associated with the *llanero*. See LATIN-AMERICAN MUSIC; SPANISH-AMERICAN LITERATURE.

Venezuela, which was regarded as one of the less profitable colonies of Spain, lacks the splendors of Spanish architecture that are found in other South American countries. Nevertheless, in the middle of the 20th century, the combination of the wealth produced from oil discoveries and strong ties with the United States has helped foster the development of modern architecture. Caracas is now considered one of the most modern cities in the world.

THE ECONOMY

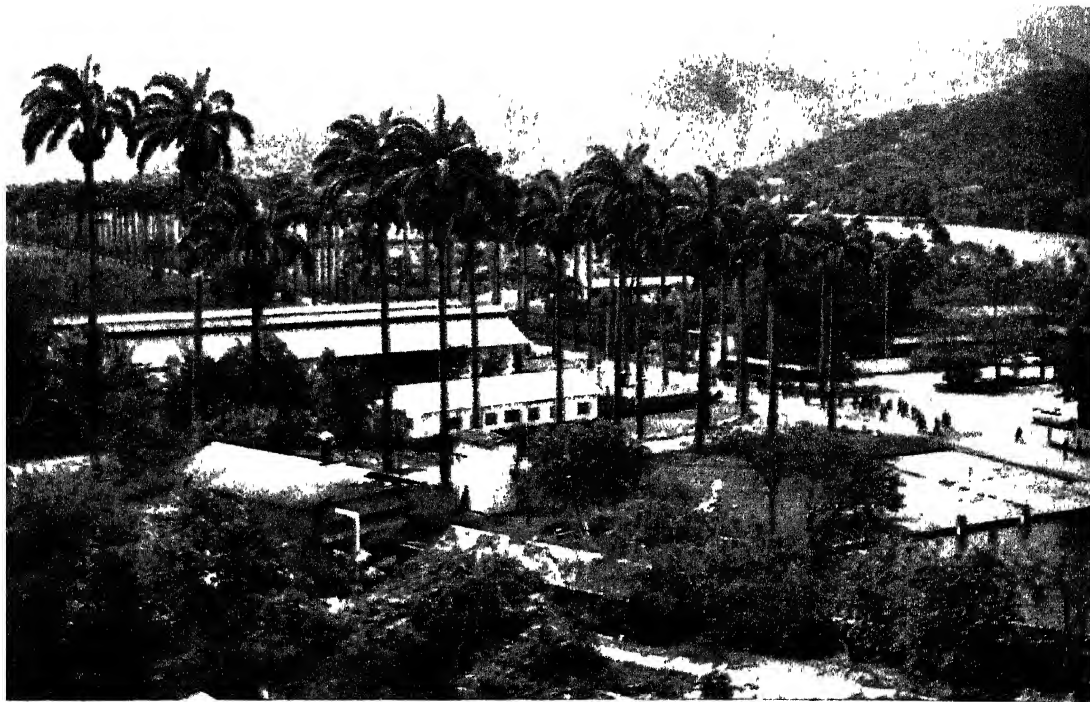
The economy of Venezuela is based primarily on the petroleum industry. Diversification of industry, however, is the long-range goal of the government and has resulted in temporary government control of some industries. The government also controls prices of certain products and services, and has established incentives and programs to develop the economy in specific sectors. In 1973 annual budget figures showed about \$3,143,000,000 in revenues and approximately \$3,122,000,000 in expenditures.

Agriculture. The government passed the Agrarian Reform Law in 1960, which is aimed at expanding and diversifying agricultural production. Under the law some 7,000,000 acres of cultivable land was distributed to some 125,000 farmers. In the late 1960's about 3 percent of the total land area was being farmed by about 34 percent of the labor force. The principal

Ongwa Indians in front of their communal house in the Guiana Highlands, the largest undeveloped region of Venezuela.

Jacques Jangoux-Photo Researchers





A large sugarcane plantation in the fertile Aragua Valley, near Maracay in northern Venezuela. The workers seen in the street have their homes on the plantation

Jane Latta

crops were sugarcane (4,200,000 tons), bananas (980,000 tons), coffee (60,000 tons), rice (244,000 tons), corn (670,000 tons), cotton (16,000 tons), and cocoa (23,500 tons). Stock raising is carried on chiefly on the llanos and E of Lake Maracaibo. In the early 1970's the livestock population numbered some 8,500,000 head of cattle, 1,670,000 pigs, 266,000 goats, and 104,000 sheep.

Forest and Fishing Industries. Although forests cover so much of the country, the lumbering industry is underdeveloped largely because of the inaccessibility of the forest areas. Lumber is used mainly by the building, furniture-manufacturing, and paper industries. In the early 1970's roundwood production totaled some 261,000,000 cu.ft. The major products were softwood, hardwood, and fine wood; other forest products include charcoal, firewood, and chicle.

The rich fishery resources of Venezuela include a wide variety of marine life. The most important commercial catch is shrimp, followed by tuna and sardines. Important pearl fisheries are located off Margarita Island.

Mining. The dominant factor in the Venezuelan economy is the oil found in the Lake Maracaibo basin and in eastern Venezuela. Oil pro-

vides about 70 percent of the total revenue of the government and more than 95 percent of all export revenue. Venezuela is the third leading producer of crude oil in the world. The greater part of oil exports go to the Netherlands Antilles (q.v.) for refining. European and U.S. oil companies own most of the oil concessions in the republic. Venezuela, however, is no longer granting such concessions, and is adopting a service-contract policy under which foreign firms carry out exploration and exploitation operations for the government-owned oil company, the Venezuelan Petroleum Corporation.

Other commercially exploited minerals include diamonds, gold, silver, platinum, coal, salt, copper, tin, asbestos and mica. Iron ore, in extensive deposits, was discovered near the Orinoco R. in the 1940's. In the early 1970's about 12,500,000 tons of iron ore were mined annually, most of which was exported. Margarita Island has some 5,500,000 tons of magnesite reserves.

Manufacturing. Since the early 1960's the government has given high priority to the development of the manufacturing sector of the economy. As a result, the area of manufacturing has grown more rapidly than any other part of the economy. Late in the decade the annual value of production by principal industries included food and beverages (\$45,500,000), chemical products (\$17,600,000), petroleum derivatives (\$14,000,000), textiles (\$13,000,000), wearing ap-

VENEZUELA, REPUBLIC OF

parel (\$12,000,000), and transport equipment (\$7,000,000).

Currency and Banking. The basic unit of currency is the bolivar, consisting of 100 centimos (4.3 bolivares equal U.S.\$1; 1975). The Banco Central de Venezuela is the government-banking agent, the sole bank of issue, and the clearinghouse for commercial banks. All banking practices are regulated by the Consejo Bancario Nacional and supervised by the Finance Ministry and the Superintendent of Banks.

Commerce and Trade. The principal exports are petroleum and petroleum derivatives, valued at some \$10,000,000,000 annually in the mid-1970's. Other major exports include iron ore, coffee, and cocoa. In the mid-1970's the total annual import value was some \$2,277,000,000, of which the principal items were machinery and transport equipment (\$1,100,000,000), food (\$350,000,000), and chemicals (\$158,000,000). The foreign trade of Venezuela is carried on primarily with the U.S.

Transportation. In the late 1960's Venezuela had some 19,000 mi. of roads, of which about 9000 mi. were paved, 8000 mi. improved, and the remainder unpaved. Highway density is greatest in the north-central area, with an extensive highway system under construction to connect major urban centers and remote rural areas. Rail transportation, totaling some 480 mi., is concentrated in the northern states. Venezuela also has some 10,000 mi. of navigable water-

ways. The country operates several domestic airlines, and is serviced by U.S., Latin-American, and European lines.

Communications. In the early 1970's Venezuela had some 444,000 telephones. More than a dozen television stations were located in the major cities, and an estimated 887,000 television sets were in use. The country had 90 radio stations and about 1,750,000 radio sets.

Labor. In the late 1960's the labor force was estimated at some 3,000,000 persons. About 21 percent of the force was employed in agriculture, 23 percent in services, 15 percent in manufacturing, and 17 percent in commerce. Organized labor in Venezuela consists of trade unions and peasant leagues, with a total membership of some 1,800,000. The largest and most powerful organization is the Confederation of Venezuelan Workers, with a membership amounting to about 80 percent of total organized labor in the country.

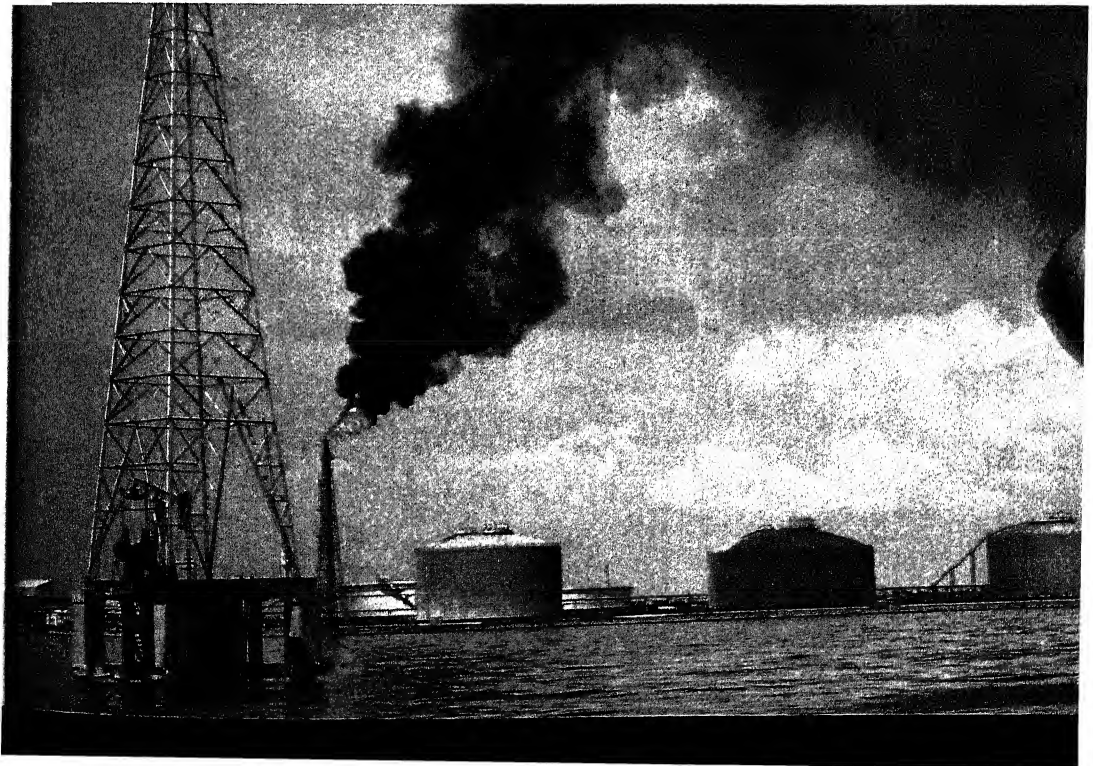
GOVERNMENT

Venezuela is a federal republic. The present constitution was adopted in 1961 and provides for executive, legislative, and judicial branches in the federal government, and stresses social, economic, and political rights.

Central Government. Executive authority is

Oil fields in Lake Maracaibo, northwestern Venezuela, where the country's richest and most extensive deposit of petroleum is located. Oil is a mainstay of Venezuela's economy.

Yoram Lehmann-Peter Arnold



VENEZUELA, REPUBLIC OF

vested in the president, who is elected by direct popular vote for a term of five years. The president may not succeed himself, but must wait ten years after completion of his term before seeking reelection. The president, who is assisted by a cabinet, is commander in chief of the armed forces. He has the right to introduce bills in congress and to veto legislation; a two-thirds majority of congress is necessary to override a presidential veto. The president may declare a state of emergency and suspend constitutional guarantees, but such an action must be approved by congress within ten days.

Health and Welfare. Venezuela has a system of public health stations throughout the rural areas for preventative work and medical assistance; in urban areas similar services are handled by sanitary units. The country has succeeded in halting the spread of tuberculosis, venereal diseases, and malaria, but typhoid fever, smallpox, and parasitic infections are still prevalent.

Social security is administered by the federal government. The present system operates under two laws and is applicable in ten of the twenty States. The program includes sickness and maternity benefits, and is contributed to equally by employer and employees.

Legislature. The bicameral congress is composed of the Senate, with 53 senators, and the Chamber of Deputies, with 133 deputies. Members of both houses are elected by direct popular vote and hold office for five years. Congress meets regularly twice a year; special sessions may be called by the president. Joint sessions are held to break deadlocks or disagreements. A bill may be introduced in either house, but must be passed in both houses. Voting is compulsory for all citizens over the age of eighteen.

Political Parties. Twelve political parties participated in the most recent election. The major parties include the Democratic Action, the Christian Social, and the Republican Democratic Union.

Local Government. The 20 States are divided into 156 districts and 613 municipalities. Each State is headed by a governor who is appointed by the president. Every State has a popularly elected unicameral legislature; each district has a popularly elected municipal council.

The territories are divided into departments, and the Federal District into departments and parishes. Federal territories and the Federal District are administered by the president.

Judiciary. The Supreme Court of Justice is elected by the congress for a term of five years; one third of the court is reelected every three years. Each State has a supreme court, superior

court or superior tribunal, and several lesser courts, and there are civil and military judges in the territories.

Defense. The armed forces of Venezuela comprise an army, navy, air force, and national guard. All male citizens of eighteen years and over are liable for two years of military service. In the early 1970's the total military personnel numbered some 36,500.

HISTORY

The coast of Venezuela was first sighted by the Italian-born navigator Christopher Columbus (q.v.) in 1498, and settlement in the country was begun by the Spanish in 1520. The first important settlement was that of Caracas in 1567.

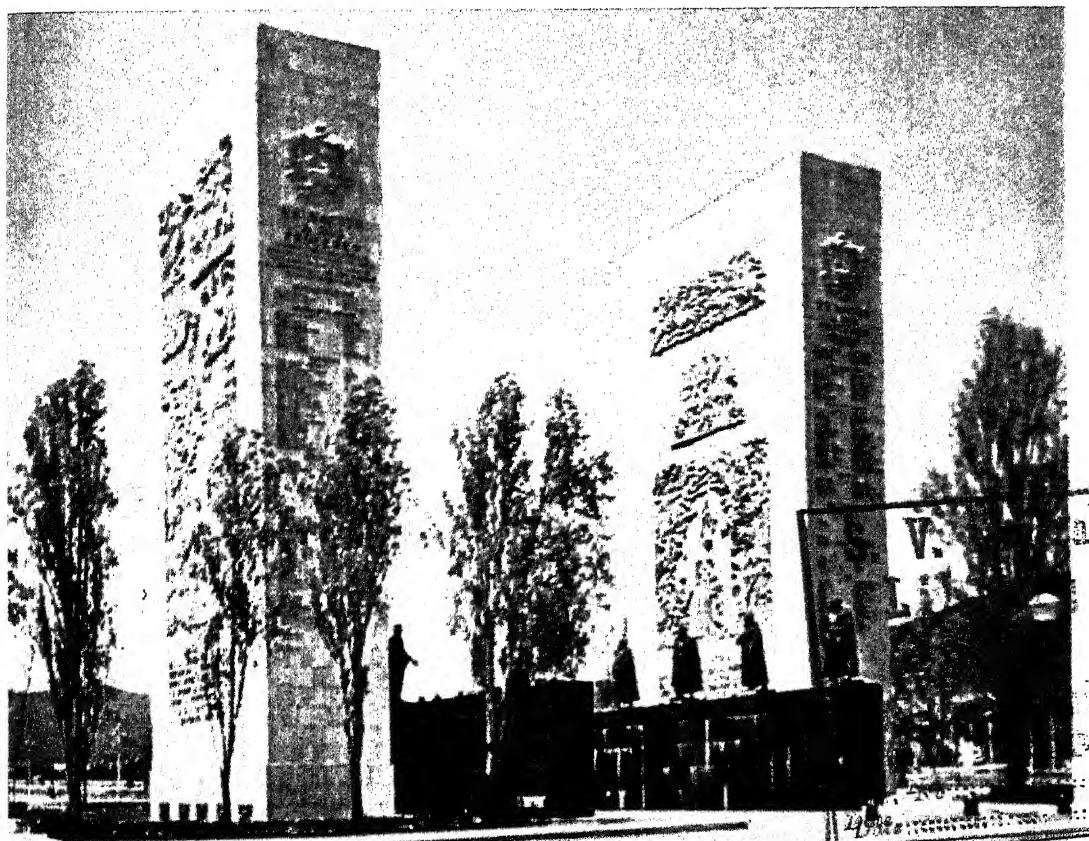
The Drive for Independence. The history of the war for independence against Spain in Venezuela is largely the record of the careers of Simón Bolívar and Francisco de Miranda (qq.v.). The revolution began in 1810 and independence was formally proclaimed on July 5, 1811. Independence was won with the decisive victory of Bolívar over the Spanish royalist army in 1821. Federated at first with Colombia and Ecuador, Venezuela constituted itself an independent republic in 1830; see COLOMBIA: *History: Independence from Spain*.

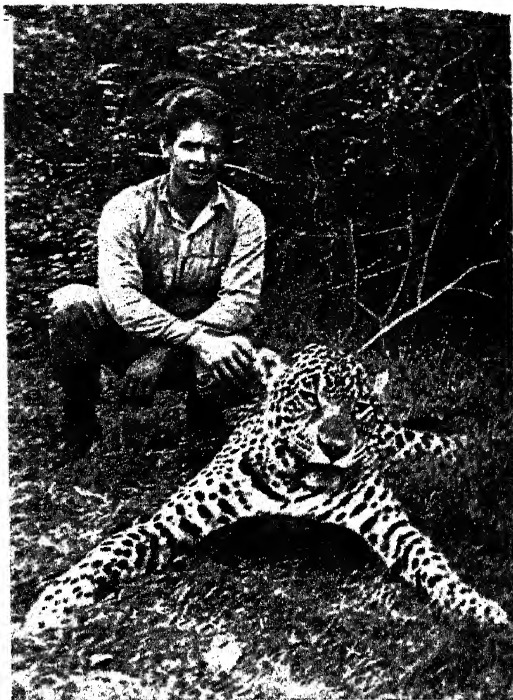
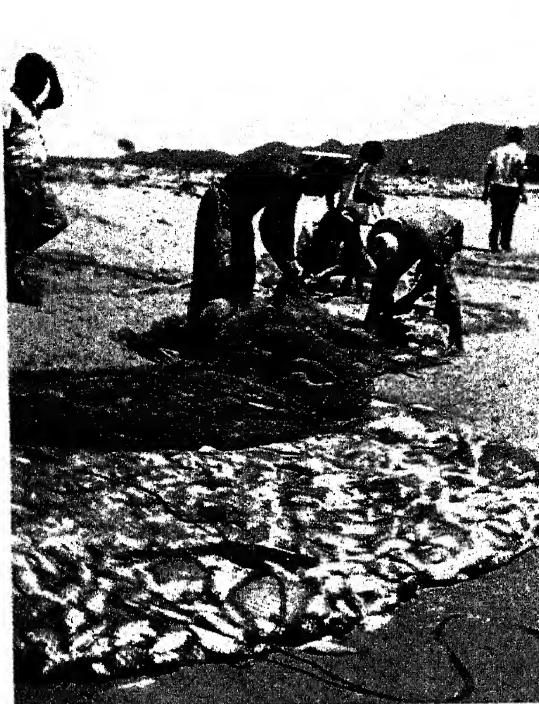
Early Dictatorships. The early history of independent Venezuela was characterized by revolutions and counterrevolutions, climaxed by the rigid dictatorship of Antonio Guzmán Blanco (1829-99) from 1870 to 1888. On two separate occasions the foreign affairs of Venezuela closely involved the U.S. The first was in 1886, when a border dispute arose between Venezuela and British Guiana. The U.S. persuaded Great Britain to submit the case to an arbitration tribunal, which subsequently awarded the larger share of the territory to Great Britain. During the rule of Cipriano Castro (1899-1908) the U.S. again intervened in a dispute involving Venezuela. In 1902 Great Britain, France, Germany, and several other powers blockaded Venezuelan ports because of the failure of the government to meet its debts. On two occasions European warships bombarded the ports. On Feb. 13, 1903, negotiations, which had been taking place in Washington, D.C., were concluded with a formal request to the Hague Tribunal for a decision; see PERMANENT COURT OF ARBITRATION. The tribunal decided in favor of the allies in 1904, and by July, 1907, Venezuela had met the obligations to the three powers. The following year Castro was deposed by General Juan Vicente Gómez (q.v.). Gómez reversed the foreign policies of Castro, which had involved Venezuela in still other difficulties with the European powers



Venezuela. Plate 1. Above: Ships travelling along the northern coast of Venezuela steer clear of the rocky shore of Margarita Island. Many small islands belonging to Venezuela lie in the Caribbean Sea off the coast which is generally steep and rough. Below: Columns commemorating the independence of the nation are engraved with the names of patriots and stand on Avenue Los Proceres in Caracas, the capital of the nation.

VIASA





Venezuela. Plate 2. Above, left: Fishermen prepare to examine and sort their catch enclosed in a net and hauled up onto a beach of Margarita Island. Above, right: The South American jaguar, sometimes called el tigre ("the tiger"), is considered a valuable trophy for hunters in the forests of Venezuela. Below: Tile-roofed houses of a village in the green and terraced foothills of the Andes Mountains.

VIASA



and with the U.S.; internally, he ruled tyrannically from 1908 until his death in 1935.

World War II and Postwar Politics. On Dec. 31, 1941, during World War II, Venezuela broke off diplomatic relations with Germany, Italy, and Japan. On Feb. 15, 1945, the Venezuelan government declared war against Germany and Japan, and later in the year became one of the original members of the United Nations. In 1945, following the overthrow of the dictatorship of General Isaías Medina Angarita (1897–1953), Dr. Rómulo Betancourt (1908–), of the moderately socialist Democratic Action Party (A.D.), assumed control of the government as provisional president. A new constitution was promulgated in 1947, providing for popular vote by means of the secret ballot. Later in the same year, after the first democratic election in Venezuela, Rómulo Gallegos (q.v.), novelist and founder of the A.D. was elected president. He took office in February, 1948. In November, the government was overthrown by an army revolt, the leaders of which immediately formed a provisional government headed by Lieutenant Colonel Carlos Delgado Chalbaud (d. 1950).

The junta suppressed the opposition and employed other dictatorial methods, including censorship of news. On Nov. 13, 1950, Delgado Chalbaud was assassinated. The junta appointed the diplomat Germán Suárez Flámerich (1907–) as provisional president. Flámerich promised that national elections for a constituent assembly would be held in the near future, and elections took place on Nov. 30, 1952. Following unofficial reports of preliminary returns favoring the opposition, an official report was issued on Dec. 2, announcing that the junta-backed government party, the Independent Electoral Front (F.E.I.), had won a substantial majority in the constituent assembly. Colonel Marcos Pérez Jiménez (1914–), the government candidate, became provisional president on Jan. 10, 1953, and leaders of the opposition were forced to leave the country.

On April 11, after three months of deliberation, the constituent assembly gave final approval to a new constitution, which was formally promulgated on April 15. By its terms the country, known officially since 1864 as the United States of Venezuela, was proclaimed the Republic of Venezuela.

The government maintained in general good contacts with other American countries, and the Tenth International Conference of American States was held in Caracas during March, 1954. Venezuela, however, broke off diplomatic relations with Argentina in July, 1957, after having

rejected numerous Argentine complaints concerning the activities in Caracas of the former Argentine dictator Juan Perón (see under PERÓN). In December the government held a plebiscite offering voters the opportunity to register approval or disapproval of the regime in power. The results showed that 2,353,935 of a total of 2,900,543 voters approved of Pérez Jiménez and his regime. Several weeks after the plebiscite a rebellion led by air force officers was suppressed by army troops.

On Jan. 21, 1958, a general strike in Caracas signaled the start of a popular uprising. Pérez Jiménez fled the country on Jan. 23, and the same day a group of military officers and civilians, known as the Patriotic Junta and led by Rear Admiral Wolfgang Larrazábal (1911–), seized control of the government. The U.S. granted diplomatic recognition to the new government on Jan. 28.

The Larrazábal government thwarted attempted coups d'état on July 22 and Sept. 7. The rebels were said to have been motivated by the belief that Larrazábal had allowed the Communist movement to function too freely. In the December elections, former President Rómulo Betancourt of the Democratic Action Party was reelected. On June 24, 1959, Betancourt was injured in an assassination attempt, which the Organization of American States (O.A.S.) stated had been instigated by the government of the Dominican Republic. Serious antigovernment rioting by Larrazábal supporters occurred in Caracas in November and December.

A New Constitution. President Betancourt promulgated a new constitution on Jan. 23, 1961. Despite constitutional provisions guaranteeing various rights to labor and expressing opposition to large landed estates, social unrest and rioting continued throughout 1961. Diplomatic relations with Cuba were severed on Nov. 11, following charges by the Venezuelan government that Cuba had in large part fomented the disorders. During 1962 and 1963 leftist groups attempted unsuccessfully to overthrow the government.

On Dec. 1, 1963, Raúl Leoni (1905–72) of the ruling Democratic Action Party was elected president. Lacking a congressional majority, Leoni formed a coalition government. For the next few years Venezuela enjoyed a large measure of political stability. In October, 1966, however, a military uprising broke out, led by the national guard garrison near Caracas. The uprising was crushed by the government, which had also been combatting guerrilla activity in the countryside and the capital throughout the year.

VENEZUELA, REPUBLIC OF

On July 29, 1967, an earthquake struck Caracas and its environs, killing some 200 persons and injuring about 2000.

Toward the end of the decade, the political life of the nation gained some tranquility. In December, 1968, Rafael Caldera Rodríguez (1905–), leader of the Christian Social Party, won a narrow election victory over Leoni. Caldera was inaugurated in March, 1969, the first time in the 140-year history of Venezuela that the ruling party had peacefully handed over power to the opposition.

In 1971 Venezuela approved a measure providing for final takeover of all foreign oil concessions by 1983, in which year most of the concessions were scheduled to expire. Oil production was down by some 9 percent in 1972, compared to 1971; and on Nov. 1, 1973, oil prices were raised by 56 percent, the fifth increase of the year.

On Feb. 13, 1973, Venezuela joined the increasingly effective Andean Common Market.

Political activity was brisk in 1973 as the presidential election neared. In May the congress ratified a constitutional amendment barring the candidacy of former President Pérez Jiménez. In the December elections, the winner was Carlos Andrés Pérez (1922–), the leader of the cen-

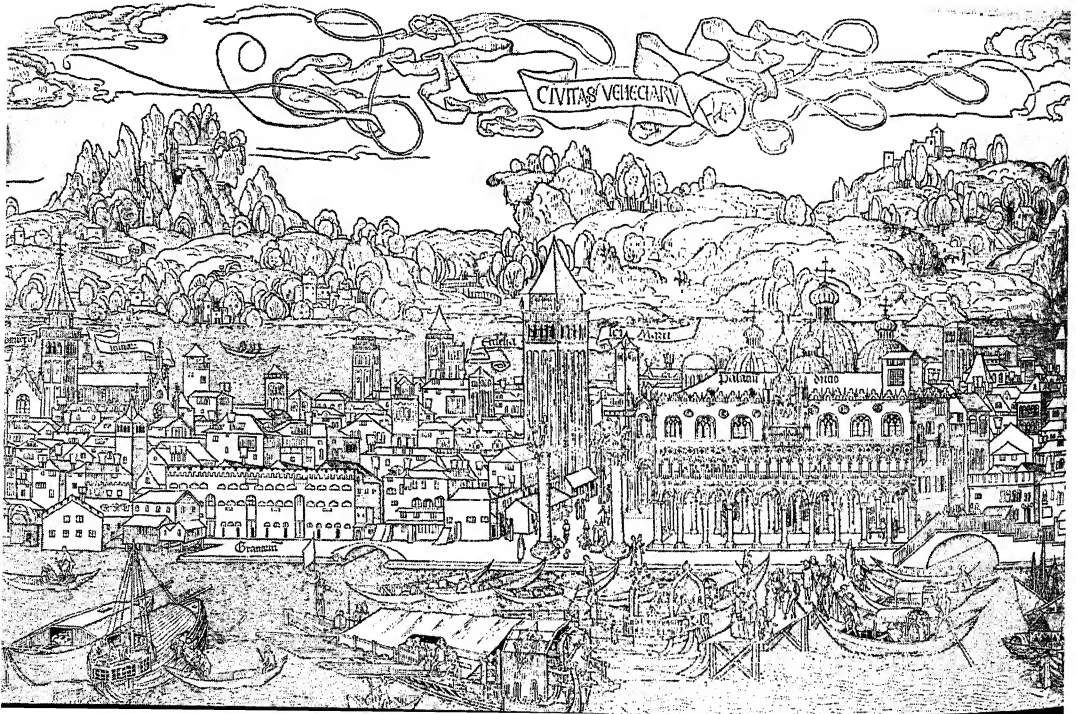
ter-left Democratic Action Party. Pérez attempted to improve relations with Venezuela's neighbors, but took an increasingly independent line from the U.S. He expressed open hostility to the military dictatorship in Chile (q.v.) and in December signed an agreement with Cuba to restore diplomatic relations.

To conserve Venezuela's dwindling oil reserves, Pérez reduced production to less than 3,000,000 bbl per day, announcing also that the oil industry would be nationalized in 1975. The iron and steel industry was nationalized in 1974; unemployment was reduced by the creation of more jobs.

VENICE (It. *Venezia*), city and seaport of Italy, in Venetia Region, and capital of Venice Province. Venice is situated on 120 islands formed by 177 canals in the lagoon between the mouths of the Po and Piave rivers, at the N. extremity of the Adriatic Sea. Because of its site and commercial fame, the city is known as the Queen of the Adriatic. A railroad and highway causeway more than 2 mi. long connects Venice with the mainland. Long sand dunes on the outer side of the lagoon are fortified by bulwarks of masonry and serve as protection against the sea. The islands on which the city is built are connected by about 400 bridges. The Grand Canal (q.v.), about 2 mi. long, winds through Venice from N.W. to S.E., dividing the city into two nearly equal portions. The Giudecca Canal, nearly a

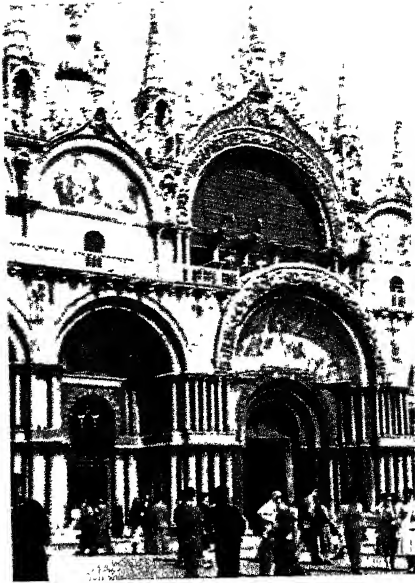
Venice in the 15th century, from a contemporary German woodcut.

Metropolitan Museum of Art

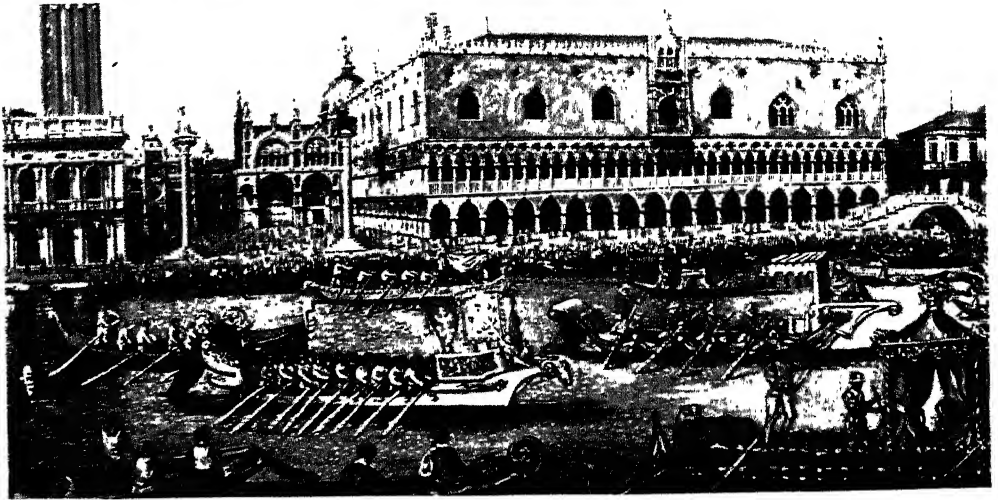




Venice. Plate 1. Four horses adorn the upper tier of the facade of the Cathedral of Saint Mark. Executed in gilded bronze by Greek artisans, they were taken from a 4th-century B.C. hippodrome at Constantinople, now Istanbul, Turkey, and shipped to Venice about 1204.



Venice. Plate 2. Top Center part of the facade of the Cathedral of Saint Mark. Considered the pinnacle of Byzantine architecture, the edifice was originally built in the 9th century but reconstructed during the next 200 years. Center A water spectacle that is celebrated annually on the Feast of the Ascension, the gala regatta commemorates, since the Middle Ages, the legendary wedding of Venice, "queen of the seas", with the Adriatic Sea (from a painting by the 20th-century Italian artist Giorgio di Chirico). Bottom The Rialto Bridge, a masonry bridge lined with a double row of shops, was built in 1588. The Grand Canal, the chief traffic artery of Venice, has been spanned by bridges of the same name since the late 12th century.



quarter of a mile wide, separates Giudecca Island, on the extreme s., from Venice proper. Many narrow, winding lanes and streets penetrate the city, but the easiest and most common method of communication is by the use of gondolas, flat-bottomed boats propelled by a single oar. Motor launches are also used for transportation.

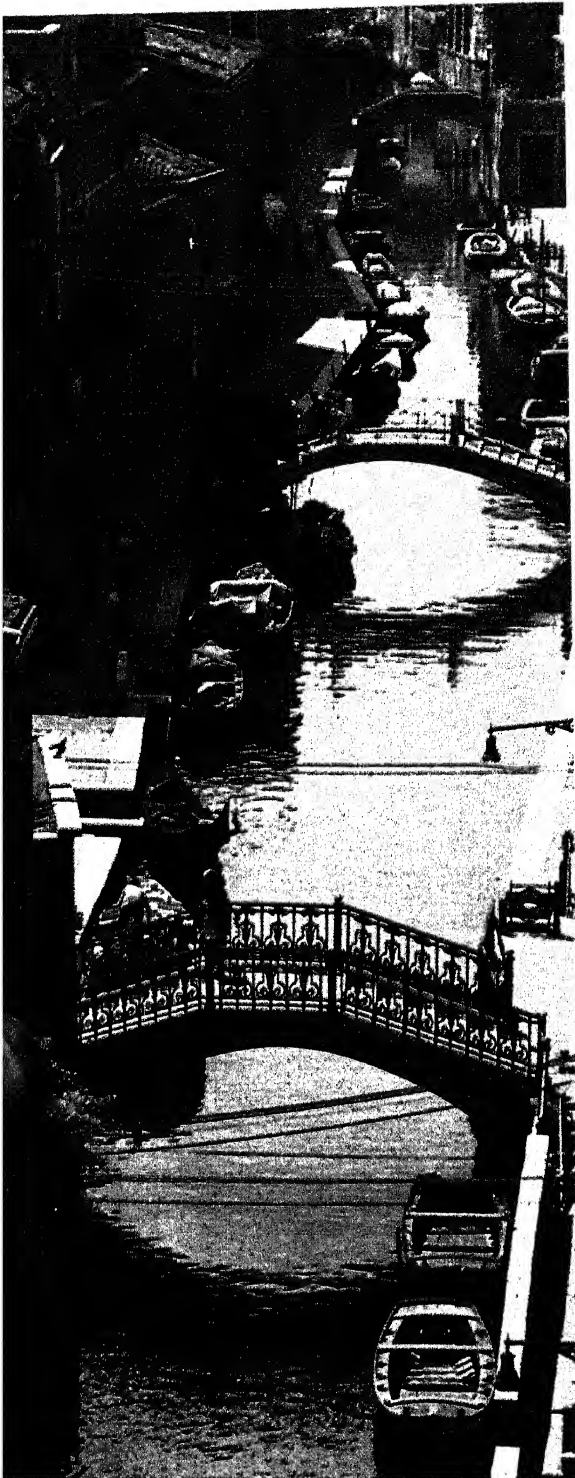
For centuries Venice has been famous for its glassware, mirrors, and glass beads, manufactured in the city and on the island of Murano. Venetian lace, made chiefly on the island of Burano, is notable. Other industries include the manufacture of brocades, tapestries, and other decorative textiles. Shipbuilding facilities and many industrial plants, including steel works, foundries, and chemical factories, are in Mestre and Marghera, on the mainland across from Venice. The Marghera port, which handles a large part of the Venetian traffic, is reached by a channel which is an extension of the Giudecca Canal.

Sights. Architecturally and artistically, Venice is considered one of the most beautiful cities in the world. The city buildings and decorations, from Byzantine to Renaissance styles, show great artistic achievement. The works of the Venetian school of painting and art are represented throughout Venetian palaces, public buildings, and churches. The center and most frequented part of the city is Saint Mark's Square. At the e. end are Saint Mark's Cathedral (q.v.) and the Doge's Palace, the two most important and imposing structures in Venice. The cathedral, begun about 828, reconstructed after a fire in 976, and rebuilt between 1047 and about 1071, is considered one of the outstanding examples of Byzantine architecture in the world. The palace, begun about 814, destroyed four times by fire and each time rebuilt on a more magnificent scale, is a remarkable building in Italian Gothic with some early Renaissance elements. The n. side of the piazza is occupied by the Procuratie Vecchie (1496) and the s. side by the Procuratie Nuove (1584), both built in Italian Renaissance style. During the time of the Venetian republic these buildings were the residences of the nine procurators, or magistrates, from among whom the doge, or chief magistrate, was usually selected. Along the two palaces and their extension, the Atrio or Fabbrica Nuova (1810), extend arcades with cafés and shops. Near the Doge's Palace stand two famous granite columns erected in 1180, one bearing the winged lion of St. Mark (see MARK, SAINT) and the other Saint Theodore (759–826) on a crocodile. The most conspicuous feature of the

city is the campanile, or bell tower (q.v.), of St. Mark, which is about 300 ft. high; it was built between 874 and 1150 and reconstructed after it collapsed in 1902.

In the rear of the Doge's Palace is the famous Bridge of Sighs (q.v.), which connects the palace with public prisons and was the route by which prisoners were taken to and from the judgment hall. The most famous of the many bridges spanning the Grand Canal is the Rialto (1588), lined with a double row of shops. The Grand Canal is the principal traffic artery of Venice and is lined with old palaces of the Venetian aristocracy, among which are many structures of historical and architectural renown. Farther n., near the lagoon, is the 15th-century church of Santi Giovanni in Bragora, a domed and columned edifice in the Italian Gothic style and once the funeral church of the doges. In its vicinity is the greatest monument in Venice, the 15th-century equestrian statue of the Venetian general Bartolommeo Colleoni (1400–75), the work of the Florentine artist Andrea del Verrocchio (q.v.). The same section is the site of the arsenal (founded 1104) and the public gardens, 20 acres in extent. Islands extend to the e. in the direction of the Lido, an island reef outside the lagoon and famous as a bathing beach and recreational resort. Museums and monuments are found throughout the city. The Library of St. Mark contains about 13,000 manuscripts and more than 400,000 books, some of immense value. The University of Venice was founded in 1868.

History. The site around Venice was inhabited in ancient times by the Veneti (q.v.), a people of n.e. Italy. The city was founded, traditionally, in 452 A.D., when the inhabitants of Aquileia, Padua, and other northern Italian cities took refuge on the islands of the lagoon from the Teutonic barbarians who invaded Italy during the 5th century. They established their own government, which was headed by tribunes for each of the twelve principal islands. Although nominally part of the Eastern Roman Empire, Venice was virtually autonomous. In 697 the Venetians organized Venice as a republic under an elected doge. Internal dissension disturbed the course of government during the following century, but the threat of foreign invasion united the Venetians. Attacks by Saracens (q.v.) in 836 and by the Hungarians in 900 were repulsed. In 991 Venice signed a commercial treaty with the Saracens, initiating the Venetian policy of trading with the Muslims rather than fighting them. The Crusades (q.v.), and the resulting development of trade with the Orient, led to the establish-



Although Venice has streets, it is preeminently a city of canals, some 177 of them, along which the gondola is the traditional means of travel.

James Andrew Carr—Photo Researchers

ment of Venice as the greatest commercial center for trade with the East. The republic greatly profited from the partition of the Byzantine Empire (q.v.) in 1204 and became politically the strongest European power in the Mediterranean region. The growth of a wealthy aristocracy gave rise to an attempt by the nobles to acquire political dominance, and, although nominally a republic, Venice became a rigid oligarchy by the end of the 13th century. In the 13th and 14th centuries Venetian history was characterized by a series of wars with Genoa (q.v.), the commercial rival of Venice. In the war of 1378–81, however, Genoa was compelled to acknowledge Venetian supremacy. Wars of conquest enabled Venice to acquire neighboring territories, and by the late 15th century, the city-state was the leading maritime power in the Christian world.

The beginning of Turkish invasions in the middle of the 15th century marked the end of Venetian greatness. Thereafter its power declined in the face of attacks by foreign invaders and other Italian States and after the discovery of a sea route to the Indies around the Cape of Good Hope by the Portuguese navigator Vasco da Gama (q.v.) in 1497–98. In 1508 the Holy Roman Empire, the pope, France, and Spain combined against Venice in the League of Cambrai and divided the Venetian possessions among themselves. In 1516 Venice reacquired its Italian dominions through astute diplomacy, but its age of political power was ended.

In 1797 the Venetian Republic was conquered and ended by Napoléon Bonaparte, later Napoleon I (q.v.), Emperor of France, who turned the territory over to Austria. In 1805 Austria was compelled to yield Venice to the French-controlled kingdom of Italy, but regained it in 1814. A year later Venice and Lombardy were combined to form the Lombardo-Venetia kingdom. The Venetians, under the Italian statesman Daniele Manin (1804–57), revolted against Austrian rule in 1848, and a new republic was established. Austria, however, reestablished control a year later. In 1866, after the Seven Weeks' War, Venice became part of the newly established kingdom of Italy.

Population (1971) 364,003.

VENIZELOS, Eleutherios (1864–1936), Greek statesman and diplomat, born in Crete, and educated at the University of Athens. He served in the Cretan assembly, participated in a revolt against Turkish rule, and intermittently headed the government of Crete between 1898 and 1909; see *CRETE: History*. In 1910 he became prime minister of Greece and in 1912 he formed the Balkan League (q.v.). Subsequently, he

guided his country through the Balkan Wars (q.v.). During World War I (q.v.) differences with Constantine I, King of Greece (see *under* CONSTANTINE), who was pro-German, kept Venizelos out of office. In 1916, however, he formed an opposition government that took control and in 1917 went into the war on the Allied side. In the elections of 1920, he was overwhelmingly defeated and he did not actually return to leadership until 1928, when he began a four-year term as premier. He served as a stabilizing force in Greece, which was in constant conflict between royalist and anarchist forces. After twice again serving briefly as premier, Venizelos led an unsuccessful republican revolt in Crete in 1935, after which he was forced into exile.

VENTILATION. See HEATING, VENTILATION, AND AIR CONDITIONING.

VENTRILOQUISM, art of speaking such that the projected sound seems to originate elsewhere, as from a hand-manipulated dummy. The skill, which dates back to ancient religious rites, involves modifying one's voice through slow exhalation while speaking, minimizing movement of the tongue and lips, and maintaining an impassive facial expression so as to focus observers' attention on the illusory source of the sound. Lip-moving consonants are avoided or slurred. Where a lap-held dummy is used for a seeming conversation, the ventriloquist must alternate alertly between his artificial, or thrown, voice and his normal voice. In the United States ventriloquists were highly popular in vaudeville (q.v.) acts and are still seen on variety and children's shows on television. One of the most popular American ventriloquists was Edgar Bergen (1903–), whose bespectacled dummy is Charlie McCarthy.

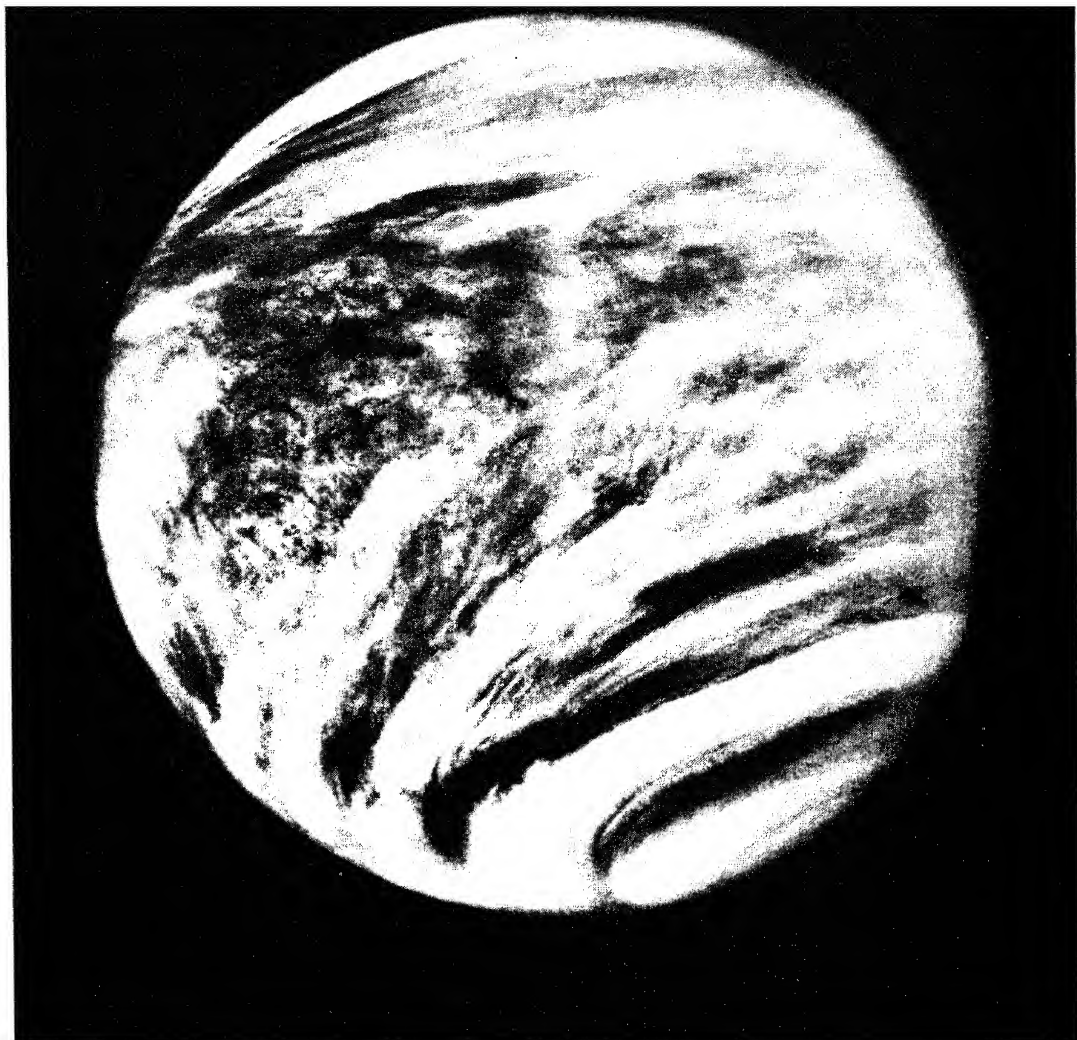
VENTRIS, Michael George Francis. See MINOAN CULTURE.

VENTURA, or SAN BUENAVENTURA, city in California, and county seat of Ventura Co., on the Pacific Ocean, 64 miles N.W. of Los Angeles. The principal industries are oil production, food processing, garment manufacturing, and the processing of building blocks. One of the oldest settlements on the Pacific Coast, Ventura contains many interesting landmarks, including the Mission San Buenaventura, founded in 1782, and the Padre Serra Cross, the original of which was erected on the site on March 31, 1782, by the Spanish missionary Junipero Serra (q.v.). A museum in the city contains collections of early Indian, Spanish, and Mexican objects. Pop. (1960) 29,114; (1970) 55,797.

VENUS, conspicuous planet in the solar system (q.v.), at a mean distance of 67,200,000 mi.

from the sun, and revolving in an orbit between the paths of earth and Mercury. The planet approaches closer to the earth than any other. Venus is slightly smaller than the earth. The diameter of Venus is about 7700 mi.; its mass and surface gravity are each about four-fifths that of the earth. Venus completes a revolution about the sun in 224.7 days, and has a synodic or phase period of 584 days. As viewed through a telescope, the planet undergoes phases similar to those of the earth's moon, and varies in size from a mere sickle of light to a complete circle. The high reflecting power of Venus, equivalent to a stellar magnitude of -4.4 , is higher than the magnitude of any fixed star. The planet is known as the morning star when it appears in the east at sunrise, and the evening star when it is in the west at sunset. Astronomers in ancient times called the morning star Phosphorus or Lucifer and the evening star Hesperus. The daytime brilliance of the planet enables navigators to use it as a point of reference in navigation; see NAVIGATION: *Celestial Navigation*. Venus passes directly across the face of the sun, relative to observers on the earth, at irregular intervals; such a passage is called a transit of Venus. The transits occur in the following repeating series of intervals: 8 years, $121\frac{1}{2}$ years, 8 years, $105\frac{1}{2}$ years, 8 years, $121\frac{1}{2}$ years. . . . The last transits occurred in 1874 and 1882 and future transits will occur in 2004, 2012, 2117, and 2125.

Exploration of Venus. Several space probes have been fired toward Venus by the United States and the Soviet Union. The first in the series of Veñera space vehicles was sent toward the planet by the Soviet Union in February, 1961, but the radio of Veñera I ceased operating twelve days after launching. On Aug. 27, 1962, the U.S. launched Mariner II, which, on Dec. 14, 1962, passed within 21,648 mi. of the surface of Venus. Various instruments aboard Mariner II made measurements of the planet that had never been obtained from earth. The measurements were automatically radioed to receiving stations in Johannesburg, South Africa; Woomera, Australia; and Goldstone, Calif. The temperature of the planet's surface was found to be about 800° F., although this finding has recently been questioned by Soviet and U.S. scientists. The top of the dense cloud layer surrounding Venus has a temperature of about -30° F. No significant amount of carbon dioxide gas was detected in the upper part of the clouds. The planet was found to have little or no magnetic field, assumed by space researchers to be less than 10 percent of that of the earth. The planet was also found to rotate slowly or not at all.



On its way to Mercury in 1974, the U.S. interplanetary space probe Mariner X flew past Venus on February 6 and radioed this view of that cloud-covered planet to earth the next day. The picture was compiled by scientists from photographs taken at a distance of 450,000 mi. from Venus.

Jet Propulsion Laboratory

(The magnetic field of the earth is believed to be caused by its rotation as well as by the motion of the fluid core.) More recent radar studies of Venus, however, using the 1000-ft.-wide, dish-shaped radar antenna at Arecibo, Puerto Rico, indicate that the planet does rotate and that the direction of its rotation is retrograde, or opposite to that of the other planets; see RADAR ASTRONOMY. The rate of rotation, which is 243 ± 1 day, is so slow that it was not detected by the instruments aboard Mariner II.

In 1966, two Soviet space probes were launched toward Venus, Veñera II, skimming within 14,912 mi. of the planet on Feb. 27, and Veñera III, striking the surface on March 1.

Veñera IV of the U.S.S.R. and Mariner V of the U.S. were launched June 12 and June 14, 1967, respectively. Veñera IV reported the Venusian atmosphere to contain 90 to 95 percent carbon dioxide, 0.4 to 1 percent oxygen, and 1.6 percent water vapor, but Mariner V showed the atmosphere to contain 72 to 87 percent carbon dioxide. Other Soviet Venus probes, Veñera V and Veñera VI, were launched on Jan. 5 and 10, 1969, respectively, arriving in the vicinity of the Venusian atmosphere on May 16 and 17 the same year. Although few of the details of the flight are known, it was announced that Veñera V had made a 51-min. parachute descent to the surface of Venus, during which it made measurements of the temperature, pressure, and chemical composition of the atmosphere.

In February, 1974, the U.S. probe Mariner X, while on its way to Mercury (q.v.), flew within 3600 mi. of the surface of Venus and confirmed that the planet had little, if any, magnetic field.

It also found the planet shrouded in turbulent clouds and measured equatorial jet streams exceeding velocities of 220 m.p.h., or fifty times the rotation speed of the planet itself. Traces of oxygen, carbon dioxide, and helium were also found in the upper atmosphere.

Soft Landing. The first landing of a probe on Venus was achieved by the Soviet Union on Dec. 15, 1970. It was announced that the 2590-lb. *Venera VII*, launched 120 days earlier, passed through the thick Venusian atmosphere, transmitting data for about 35 min.; it then rested on the surface, continuing to send information for another 23 min., making it the first time that information was relayed directly from the surface of another planet in the solar system.

The instruments on *Venera VII* reported the surface temperature of Venus to be 475° C., with an error margin of about 20° C., giving the approximate value of 847° to 923° F. The atmospheric pressure at the surface was reported to be between 75 and 105 times that on earth and composed of over 90 percent carbon dioxide. The density of the atmosphere was thus estimated to be about 60 times that of the earth. At the time of landing, the distance between Venus and earth was about 36,300,000 mi.; the radio signals took 3 min. 23 sec. to reach earth.

Venera VIII was launched in March, 1972; it made a soft landing on Venus on July 22 and transmitted data to earth for more than 1 hr. Although not much data was revealed by the Soviet Union, it was thought that the upper Venusian atmosphere might be composed of impure hydrochloric acid, or water vapor containing about 25 percent hydrogen chloride and some impurities.

VENUS, in Roman mythology, originally a goddess of gardens and fields, later identified with Aphrodite (q.v.), the Greek goddess of love and beauty. In imperial times she was worshiped under several aspects. As Venus Genetrix, she was worshiped as the mother of the hero Aeneas (q.v.), the founder of the Roman people; as Venus Felix, the bringer of good fortune; as Venus Victrix, the bringer of victory; and as Venus Verticordia, the protector of feminine chastity. Venus was the wife of Vulcan (q.v.), god of metalwork, but she was often unfaithful to him. Among her many lovers were Mars, the god of war, the handsome shepherd Adonis (qq.v.), and Anchises, the father of Aeneas. Venus was also the mother of Cupid (q.v.), god of love.

VENUS DE MILO. See GREEK ART AND ARCHITECTURE: *Hellenistic Period*.

VENUS, GIRDLE OF. See CTENOPHORA.

VENUS'S-FLYTRAP. See CARNIVOROUS PLANTS.

VERACRUZ LLAVE, city and port of Mexico, in Veracruz State, on the Gulf of Campeche, about 190 miles E. of Mexico City. It is the commercial and industrial center of an important oil region. The industrial products include cement, chocolate, cigars, flour, seafood, shoes, and textiles.

The city was founded in 1519. It was captured by the United States Army in 1847 during the Mexican War (q.v.). The French occupied it during the invasion of Mexico in the 1860's, and the U.S. again occupied it for a short time during 1914. Pop. (1970 prelim.) 242,300.

VERB, in traditional grammar, a word indicating some form of action. It is one of the eight parts of speech and possesses the finite attributes of person, number, tense, mood, and voice. Person and number tell who performed the action (I, you, he, she, it, we, you, they), and whether the action was performed by one person or more than one. Tense tells when the action was performed. Mood indicates the frame of mind of the performer of the action. Voice tells whether the subject of the verb performed or received the action. All of these variations constitute the inflections of the verb and are known as conjugation. Certain words, derived from verbs but not functioning as verbs, are called verbals. The verbals are the participles serving as adjectives, the gerunds serving as nouns, and the infinitives often serving as nouns.

VERBENA, common name applied to garden plants of the genus *Verbena*, in the family Verbenaceae. The genus contains about 100 species, most of which are native to tropical America. Most cultivated verbenas are hybrid varieties of recognized species, and are classified as selfs, or single-colored varieties, oculatas, or eyed varieties, and Italians, or striped varieties. Garden verbenas, *V. hybrida*, introduced into the United States from Brazil, is the most commonly cultivated hybrid; it is a semitrailing plant bearing various combinations of single-colored, eyed, or striped flowers blooming continuously from early summer until late fall.

VERCELLI (anc. *Vercellae*), city of Italy, in Piedmont Region, and capital of Vercelli Province, on the Sesia R., about 39 miles s.w. of Milan. It is a leading rice market and an industrial center, with factories engaged in the manufacture of textiles, foodstuffs, and machinery. Points of interest include the 13th-century basilica of Sant'Andrea and several churches decorated with frescoes by the Italian Renaissance painter Gaudenzio Ferrari (q.v.). The ancient cathedral contains a library of valuable works,

VERCINGETORIX

notably the famous Vercelli Book, an Old English manuscript containing homilies and poems and dating from the early part of the 11th century. In ancient times the city came under the control of the Ligurians, Romans, Lombards (q.v.), and Franks (q.v.) successively. In the 14th century it was controlled by the powerful Visconti family of Milan, who ceded it in the 15th century to the House of Savoy; see SAVOY, House of. In 1861 the city became part of the newly formed Kingdom of Italy. Pop. (1971) 56,494.

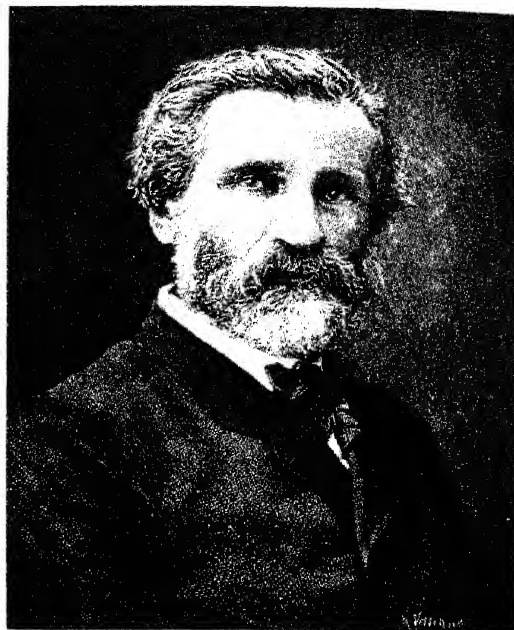
VERCINGETORIX (d. 46 B.C.), Gallic chieftain, born in Auvergne (now a region of France). In 52 B.C. he was chosen king by the Arverni, a powerful Gallic tribe that occupied the Auvergne. That same year he led the Arverni and other Gallic tribes in a revolt against Roman rule. Although Vercingetorix's initial campaigns against the Romans met with notable success, he was subsequently defeated and captured by the Roman general Gaius Julius Caesar (q.v.) at Alesia (near modern-day Dijon, France). The Gallic chieftain was taken to Rome, where he was exhibited in 46 B.C. as a symbol of one of his conqueror's triumphs and then put to death. Caesar's victory over Vercingetorix broke Gallic resistance to Roman conquest and brought the Gallic Wars (58–51 B.C.) to a close. See FRANCE: History: Early History.

VERDI, Giuseppe (1813–1901), Italian operatic composer, born in Roncole in the former duchy of Parma. His first musical education was obtained in the neighboring town of Busseto. Then, upon being rejected in 1832, because of his age, by the Milan conservatory, he became a pupil of the Milanese composer Vincenzo Lavigna (1766–1836). He returned to Busseto in 1833 as conductor of the Philharmonic Society.

Early Works. At twenty-five Verdi again went to Milan. His first opera, *Oberto*, was produced at La Scala (q.v.) with some success in 1839. His next work, the comic opera *Un Giorno di Regno* ("King for a Day", 1840), was a failure, and Verdi, lamenting also the recent deaths of his wife and two children, decided to give up composing. After more than a year, however, the director of La Scala succeeded in inducing him to write *Nabucco* (1842). The opera created a sensation; its subject matter dealt with the Babylonian captivity of the Jews, and the Italian public regarded it as a symbol of the struggle against Austrian rule in northern Italy. *I Lombardi* (1843) and *Ernani* (1844), both great successes, followed, but of the next ten only *Macbeth* (1847) and *Luisa Miller* (1849) have survived in the permanent operatic repertory. His three following works, *Rigoletto* (1851), *Il Trovatore* (1853), and

La Traviata (1853), brought Verdi international fame and remain among the most popular of all operas.

Middle Period. Operas written in the middle of his career, including *Un Ballo in Maschera* ("A Masked Ball", 1859), *La Forza del Destino* ("The Force of Destiny", 1862), and *Don Carlos* (1867), exhibit a greater mastery of musical char-



Giuseppi Verdi

acterization and a greater emphasis on the role of the orchestra than his earlier works. *Aïda* (1871), also of this period and probably Verdi's most popular opera, was commissioned by the khedive of Egypt to celebrate the opening of the Suez Canal; it was first performed in Cairo. Three years later, Verdi composed his most important nonoperatic work, the *Requiem* Mass in memory of the Italian novelist Alessandro Francesco Tommaso Antonio Manzoni (q.v.). Verdi's other nonoperatic compositions include the dramatic cantata *Inno delle Nazioni* ("Hymn of the Nations", 1862) and the String Quartet in E minor (1873).

Late Works. In his seventies, Verdi produced the supreme expression of his genius, *Otello* (1887), composed to a libretto skillfully adapted by the Italian composer and librettist Arrigo Boito (1842–1918) from the Shakespearean tragedy *Othello*. This was followed by Verdi's last opera, *Falstaff* (1893), also adapted by Boito from Shakespeare, and generally considered one of the greatest of all comic operas.

As a whole, Verdi's works are most noted for their emotional intensity, tuneful melodies, and dramatic characterizations. He transformed the Italian opera, with its traditional set pieces, old-fashioned librettos, and emphasis on vocal displays, into a unified musical and dramatic entity. His operas are among those most frequently produced in the world today.

See OPERA.

VERDICT, in law in the United States and Great Britain, the pronouncement of the jury upon matters of fact submitted to them for their deliberation and determination. In civil cases, verdicts may be either general or special. A general verdict is one in which the jury pronounces generally upon all the issues, in favor of either the plaintiff or the defendant. It is a finding in favor of the prevailing party as to every material fact properly submitted for the consideration of the jury. A special verdict is one in which the jury finds the facts particularly and then leaves to the court the decision on questions of law arising on them. As a rule, however, special verdicts are not applicable to criminal cases and in most instances the jury renders a general verdict of "guilty" or "not guilty".

It is the function of the jurymen to determine, from the conflicting evidence presented to them, the facts they consider to have been established and to make a proper application of the law relating to those facts as charged by the court. It is the exclusive province of the court to interpret the law and state to the jury what principles of law are applicable to the facts in the case, and such statement and exposition of the law is binding upon the jury. It is the sole province of the jury, however, to determine the facts based upon the evidence presented to it.

Generally, the jury's verdict must be unanimous. In a number of States, however, the condition of unanimity has been modified and verdicts can consequently be rendered by a designated majority of the jury. All jury members must be present in court when the verdict is given, and in most jurisdictions either litigant has the absolute right to have the jury polled. In polling a jury, each jurymen is asked if the verdict is the one he favored. If the required number of jurors do not answer this question in the affirmative, the verdict, of course, cannot stand.

In a number of States the judge may direct the jury to render a verdict in favor of one of the litigants when the evidence conclusively establishes the right of such party to a verdict. A verdict which appears to the court to be against the weight of evidence may be set aside by the court and a new trial ordered. In criminal cases,

the defendant must be present when the verdict is rendered. A verdict of acquittal is conclusive upon the prosecution (the state), thus precluding double jeopardy (q.v.), but the defendant may be tried again in the event the jury disagrees.

VERDIN, small perching bird, *Auriparus flaviceps*, of the Titmouse family (Paridae), native to the southwestern United States and Mexico. About 4 in. long, it is grayish-green with a yellow head and has a white underside and chestnut coloring around the shoulders. The verdin is related to the chickadee (see TITMOUSE) and the bushtit (q.v.) but is more nervous in its movements and whistles shrilly when it is approached. The large, spherical nest of the verdin, built near the end of branches, is composed of protective thorny twigs.

VERDUN, city of Canada, in Québec Province, in Hochelaga Co., on Montréal Island adjoining Montréal on the s. and 5 miles s.w. of the city center, included in the Montréal metropolitan area. It is on the Laprairie Basin of the Saint Lawrence R.; Île des Soeurs, or Nun's Island, lies offshore. Local manufactures include metal products, food products, and apparel. The Riverfront Park contains a municipal auditorium. Settled in 1660, the city was incorporated in 1912. Pop. (1976) 68,013.

VERDUN (anc. *Verdunum*), town of France, in Meuse Department, on the Meuse R., about 40 miles w. of Metz. The manufactures include confections, hardware, leather goods, and liqueurs. After the Franco-German War of 1870-71, it was made the most strongly fortified town in the e. of France. The cathedral dates from the 11th century. The fortress has been besieged several times. It was besieged by the Germans for six weeks in 1870, when it capitulated. Verdun was also the scene of one of the most important battles of World War I; see VERDUN, BATTLE OF. Pop. (1968) 24,716.

VERDUN, BATTLE OF, major engagement of World War I (q.v.), fought between German and French forces from February to December, 1916. On Feb. 21, the Germans launched an attack on the French town and fortress of Verdun. Verdun occupied a vital position on the heights above the Meuse R. at the eastern extremity of the trench line in France.

The attack began with a German artillery bombardment, unprecedented in intensity, of the outlying forts. The French fell back to prepared positions and the German command, intensifying the onslaught, pushed forward, disregarding the enormous loss of life. Fort Douaumont fell to the Germans on Feb. 25. That

VERDUN, TREATY OF

same day General Henri Philippe Pétain (q.v.) was placed in command of the French troops at Verdun. With French reserves arriving continuously, Pétain's men met the unceasing attacks by densely massed German formations with increasing confidence. Although Haucourt was lost to the Germans on March 22, and Malancourt a week later, the initial German drive for Verdun had definitely failed.

German attacks continued, however, with little intermission. By April the French air force gained control of the skies over the battlefield, a factor that played an important role in the successful defense of the area. In June a new German drive succeeded in capturing the forts of Vaux and Thiaumont. Now, however, the pressure began to slacken appreciably. To disperse the military strength of the Germans and thus relieve the strain on the French, the British had opened an attack on the Somme R., which necessitated the transfer of considerable German forces. The fighting lessened, and General Robert Nivelle (1856–1924), who had succeeded Pétain as commander, prepared for a sudden and smashing blow north of Verdun.

On Sept. 24, the French under General Charles Mangin (1866–1925) advanced on a 4-mi. front, recapturing Douaumont and Thiaumont. With this resumption of the French offensive, the last hope of the Germans to turn the Allied line at Verdun was shattered. The French attacks persisted throughout October, and Fort Vaux was evacuated by the Germans early in November. By the end of the year the French occupied substantially the positions from which they had been routed in February.

The losses on both sides were very high, the French admitting to nearly 350,000 casualties and the Germans to 330,000. The battle itself was totally indecisive, gaining no strategic advantage to either side.

See *WORLD WAR I: The Campaigns and Other Events of 1916 and Early 1917*.

VERDUN, TREATY OF, peace concluded in 843 at the free imperial city of Verdun (now a town in France) between the three surviving sons of Louis I (q.v.), Holy Roman Emperor, who had died in 840. The treaty ended a struggle among the brothers for possession of the Frankish empire established by their grandfather Charlemagne (q.v.), Emperor of the West; see **FRANKS**. Under the terms of the agreement the empire was divided into three parts, thus ending the brief unification of western Europe. The oldest son, Lothair I (see *under* **LOTHAIR**), who had succeeded his father as Holy Roman emperor, received the central portion of the em-

pire, including Italy, the Low Countries, Alsace, Lorraine, and Burgundy. Louis II, called the German (see *under* **LOUIS**) was given control of the eastern Frankish empire, which came to be known as Germany. Charles the Bald, later Charles II (q.v.), Holy Roman Emperor, received the western Frankish empire, which became the kingdom of France. See **CAROLINGIAN**; **FRANCE**; *History: The Carolingians*; **HOLY ROMAN EMPIRE**. **VEREENIGING**, city of South Africa, in Transvaal, on the Vaal R., which here forms the border with the Orange Free State, 31 miles s. of Johannesburg. A major steel center in the country's largest area of coal mines, worked since the 1870's, the city derives power from stations on the Vaal R. In addition to iron and steel, it manufactures liquid fuels, chemicals, brick and tile, lime and gypsum, agricultural implements, industrial equipment, plastics, lumber, bicycles, and corn products. The adjoining Vanderbijl Park, established in 1942, is also a steel center. Vereeniging has a technical college for advanced training, and a government pasture-research station is to the s. Sharpeville, a Bantu town, is a suburb of Vereeniging. The city was founded in 1892 as Association. The Treaty of Vereeniging, ending the Boer War, originated here in 1902. The city was formed in 1905. Pop. (1970) 196,357.

VERGA, Giovanni (1840–1922), Italian writer, born in Catania, Sicily. One of Italy's greatest novelists, he first wrote fashionable and popular romances, and it was not until he began writing about Sicilian peasants and fishermen that his true genius became apparent. In a number of his short stories and in his novels *I Malavoglia* (1881; Eng. trans., *The House by the Medlar Tree*, 1890) and *Mastro-don Gesualdo* (1889; Eng. trans., 1923), Verga depicted the life and customs of the Sicilian lower classes in a detailed, dramatic, and starkly realistic manner. His style of writing, which was based on keen observation of life, is a foremost example of the *verismo* movement in Italian literature. One of Verga's most popular stories, *Cavalleria Rusticana* (1880; Eng. trans., *Rustic Chivalry*, 1928) is the basis for the opera of that name written by the Italian composer Pietro Mascagni (q.v.) in 1890. See **ITALIAN LITERATURE: The 19th Century**. **VERGIL** or **VIRGIL** (Lat. *Publius Vergilius Maro*) (70–19 B.C.), Roman poet, born in Andes near Mantua, and educated in literature, rhetoric, and philosophy at Cremona, Milan, Rome, and Naples. The patronage of Gaius Cilnius Maecenas (q.v.) relieved him of financial cares and allowed him to devote himself wholly to literary pursuits and to study. He spent the greater part

Vergil (portrait from the 5th-century *Codex Romanus*, in the Vatican Library) Bettmann Archive



of his life at or near Naples, numbering among his intimate friends his patron Maecenas, Octavian, who became the emperor Augustus (q.v.) during Vergil's lifetime, and many prominent poets, among them Gaius Cornelius Gallus, Horace (qq.v.), and Lucius Varius Rufus (about 74–14 B.C.). In 19 B.C. Vergil set out on a trip to Greece and Asia with the intention of revising his masterpiece, the *Aeneid* (q.v.), already substantially completed, and then of devoting the remainder of his life to philosophical study. He met Augustus in Athens and returned with him to Italy; Vergil was taken ill before embarking, and died shortly after his arrival at Brundisium (now Brindisi). On his deathbed Vergil gave directions that the *Aeneid* should be destroyed; by Augustus' order, however, the poem was edited and published by Varius Rufus and Plotius Tucca.

Minor Works. Some minor poems, known as the *Appendix Vergiliana*, was attributed to Vergil in antiquity; these include little epics (*Ciris*, *Culex*), elegies (*Lydia*, *Copa*), a didactic poem (*Aetna*), and a group of short poems called the *Catalepton*, or *Poems in a Trifling Vein*. The poems are written in the Alexandrian style (see ALEXANDRIAN AGE), many revealing the influence of Gaius Valerius Catullus (q.v.) and his school. The authenticity of the collection is disputed by

modern scholars. Some of the poems, especially a few of the *Catalepton* which deal with Vergil's life, may be youthful works. The *Aetna* is generally dated in the 1st century A.D.

The *Bucolics*. In 37 B.C. Vergil completed his first major work, the ten *Bucolics*, or *Eclogues*, pastoral poems modeled upon the *Idylls* of Theocritus (q.v.), Alexandrian poet of the 3rd century B.C. Vergil preserved the pastoral conventions of his predecessor, such as the good-natured banter of the shepherds, and their love songs, dirges, and singing matches; but he gave the *Eclogues* an original and more national character by introducing real persons and events into the poems, and by referring to other persons and events under a veil of allegory. The famous fourth *Eclogue* celebrates the birth of a child who is destined to usher in a new Golden Age of peace and prosperity; in the later Roman Empire and during the Middle Ages, the poem was regarded as a prophecy of the coming of Jesus Christ.

The *Georgics*. The *Georgics*, or *Art of Husbandry*, a poem in four books on the life of the farmer, was written from 36 to 29 B.C. The poem exhibits the highest artistic perfection to be found in Latin poetry, and its publication confirmed Vergil's position as the foremost poet of the age. Although technically a treatise on agri-

culture, the *Georgics* is also a glorification of country life and of Italy. The poem is designed to be universal in scope, as evidenced by the topics of war, peace, death, and resurrection, which respectively conclude each of the four books.

The *Aeneid*. Vergil devoted his last ten years to the composition of the *Aeneid*, a mythological epic in twelve books about the Trojan hero Aeneas (q.v.). Vergil conceived the *Aeneid* as a patriotic poem celebrating the supposed Trojan origin of the Roman people, and praising, in various prophetic passages, the achievements of Augustus in his own day. Through the power of his genius, however, the work became more significantly an epic of universal scope, concerned with human ambition and imbued with moral force. The publication of the *Aeneid* was hailed with great acclamation.

Both during and after the Renaissance (q.v.), the works of Vergil were considered sublime poetic models. In English poetry his influence is especially reflected in the works of Edmund Spenser, John Milton, and Alfred, Lord Tennyson (qq.v.).

G.E.D.

VERLAINE, Paul (1844–96), French poet, born in Metz and educated in Paris. His early works, including *Poèmes Saturniens* ("Saturnian Poems", 1866), are characterized by the anti-Romanticism of the Parnassians (q.v.) with whom

Verlaine was then associated; the verse is concerned more with technique than with feeling. In 1870 Verlaine married, but he left his wife two years later to travel and live with the seventeen-year-old poet Arthur Rimbaud (q.v.). Verlaine wounded Rimbaud during a quarrel in 1873 and was imprisoned for the next two years. The collection *Romances Sans Paroles* ("Songs Without Words", 1874), is based on his life with Rimbaud and was written in prison. Also in prison Verlaine returned to the Roman Catholicism of his childhood; his reconversion is the source of a volume of confessional religious poetry, *Sagesse* ("Wisdom", 1881).

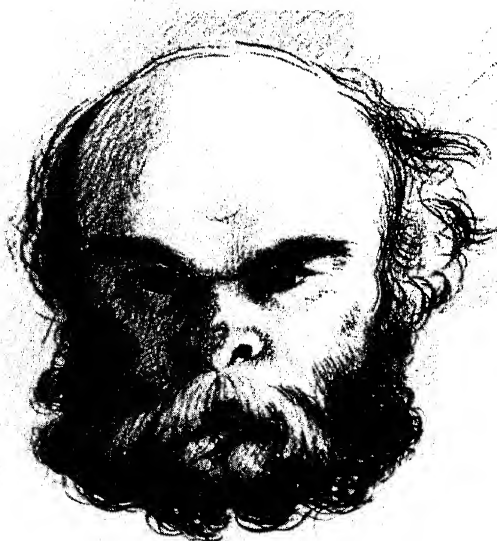
Verlaine taught French in England from 1875 to 1877, then returned to France to teach English for a year. With his student Lucien Létynois, whom he called his adopted son, Verlaine tried unsuccessfully to be a farmer. Lucien died suddenly in 1883; Verlaine's *Amour* ("Love", 1888) is primarily concerned with Lucien. The rest of Verlaine's life consisted of alternating periods of drunken debauchery and ascetic repentance. With the publication of *Les Poètes Maudites* ("Accursed Poets", 1884), a work of criticism, and of *Jadis et Naguère* ("Long Ago and Not So Long Ago", 1884), a collection of verse, Verlaine became a leader of the symbolists (q.v.), a group of poets concerned with dreams and illusion.

Verlaine thus exerted considerable influence on the French poets who followed him. The sound of his poetry is usually more important than its meaning; it is therefore unusually difficult to translate. Individual poems have been translated, however, with some approximation in English of the original French sounds. He also wrote autobiographical prose, including *Mes Hôpitaux* ("My Hospitals", 1892), *Mes Prisons* ("My Prisons", 1893), and *Confessions* (1895).

VERMEER, Jan, known also as JAN VAN DER MEER VAN DELFT (1632–75), Dutch genre, landscape, and portrait painter, born in Delft, Netherlands. After serving a six-year apprenticeship, part of it probably under the Dutch painter Carel Fabritius (1624?–54), he was admitted in 1653 to the guild of Saint Luke of Delft as a master painter. An important member of the guild, he served four terms on its board of governors and appears to have been well known to his contemporaries. He was forgotten after his death, however, and was not rediscovered until the second half of the 19th century. His reputation increased steadily thereafter, and he is currently considered one of the greatest Dutch painters. Only approximately forty paintings have been attributed to him, however, the small number being the result of Vermeer's deliber-

Paul Verlaine

French Press and Information Service





Paintings by Jan Vermeer.
Right. "Young Woman
with a Water Jug". Below:
"The Milkmaid" (about
1658).

Metropolitan Museum of Art - Gift of Henry G. Marquand



Fotocommissie Rijksmuseum Amsterdam

VERMONT

ate, methodical work habits and comparatively short life, and the disappearance of many of his paintings during the period of obscurity following his death.

With a few exceptions, including some landscapes, street scenes, and portraits, Vermeer painted sunlit domestic interiors in which one or two figures are shown engaged in such peaceful occupations as reading, writing, and playing musical instruments. These precisely executed genre paintings of 17th-century Dutch life are characterized by an almost mathematical sense of order. Vermeer is a master of composition and in the representation of space, but he is most remarkable for his treatment of light. He records the effects of light with a subtlety, delicacy, and purity of color that probably never have been surpassed. He was also a master of perspective, employing it as a means of drawing the viewer into the scene. Among his paintings are "Soldier and Laughing Girl" (between 1655–60, Frick Collection, New York City), "View of Delft" (1658, Royal Picture Museum, The Hague); and "Young Woman with a Water Jug" (between 1660–65, Metropolitan Museum of Art, New York City).

VERMONT, one of the New England States of the United States, bounded on the N by the Canadian province of Québec, on the E by the Connecticut R., on the S. by Massachusetts, and on the W by Lake Champlain and New York. Vermont measures about 159 mi. from N. to S and from about 39 to 86 mi. from E to W

Area (43rd State in rank)	9609 sq.mi.
Land	9267 sq.mi.
Inland water	342 sq.mi.
Population	(1970, 48th in rank) 444,330
	(1960, 46th in rank) 389,881
	(1950) 377,747
Altitude	95 ft. to 4393 ft.
Capital	Montpelier (1970) 8609
Largest city	Burlington (1970) 38,633
Entered Union (14th State)	March 4, 1791
Nickname	Green Mountain State
Motto	Freedom and Unity
Song	"Hail, Vermont!"
Tree	sugar maple
Flower	red clover
Bird	hermit thrush

THE LAND

The terrain of Vermont is hilly to mountainous. The Green Mts. (q.v.) extend the length of the State. Their highest peak is Mt. Mansfield (4393 ft.), the highest point in Vermont. The lowest point (95 ft.) is at Lake Champlain. The average elevation of the State is 1000 ft. The Taconic Mts. extend into Vermont in the S.W. Two thirds of Vermont is forested, and a considerable area, especially in the N and N.E., is sparsely settled.

Rivers and Lakes. The Green Mts. form a continuous watershed between the tributaries of the Connecticut R., which forms the entire bor-

der with New Hampshire, and those of the Hudson R. and Lake Champlain on the W. The chief branches of the Connecticut R. in Vermont, from N to S, are the Nulhegan, Passumpsic, Wells, White, Ottauquechee, and West rivers. Four streams, the Missisquoi, Lamoille, and Winooski rivers and Otter Creek, enter Lake Champlain; and a fifth, the Poultney R., forms part of the W boundary of the State. The Black R. in the N flows into Lake Memphremagog. Among some 400 lakes are Bomoseen Lake and Lake Dunmore in the W., Lake Carmi, in the N.W., Willoughby Lake in the N.E. and Lake Whitingham in the S.

Climate. Temperatures in Vermont in all seasons are variable but seldom extreme. Few days in summer are humid, and dry atmospheric conditions accompany the cold days of winter. The State lies in that area classed as "cool in summer". Days are usually comfortably warm and night temperatures cool. Temperatures from June through August may reach the high 80's and infrequently the low 90's; the night averages are in the 60's. The highest temperature recorded in the State was 105° F. (at Vernon); the lowest, -50° F. (at Bloomfield). The precipitation is well distributed through the year, averaging 45 in. in the S.E. and 38 in. elsewhere. Average annual snowfall is 55 to 65 in. in the W and parts of the Connecticut Valley; elsewhere it varies widely, ranging up to 120 in. The average number of days with measurable precipitation is 148 at Burlington. The coastal storms, or northeasters, common to New England are minimized in Vermont by its inland location. Tornadoes and tropical storms rarely affect the State.

Climate

Burlington

Normal temperatures (in ° F.)

January maximum	25.9
January minimum	7.6
July maximum	81.0
July minimum	58.5
Annual	44.4

Normal precipitation (in inches)

Wettest month	3.79
Driest month	1.68
Annual	32.54
Latest frost	May 8
Earliest frost	Oct. 3

Mean number of days between latest and earliest frosts

148

Plants and Animals. The native vegetation of Vermont consists principally of maples, birches, and beeches, except in the Green Mts., where spruce and fir are common. More than 130 species of grasses grow in the State, as well as a profusion of wild flowers including anemones, arbutus, forty species of orchids, and eighty species of roses. White-tailed deer and black bear are the chief large animals; other animals include the eastern cottontail rabbit, woodcock,



The village of East Corinth, set in the open rolling country of Vermont.
Vermont Development Dept.

and various species of waterfowl. The muskrat, striped skunk, mink, and raccoon are trapped for their furs. The beaver, which for a time was in danger of being exterminated, has become relatively plentiful. The only poisonous snake is the timber rattlesnake, found only in the s. areas. Trout, salmon, perch, and pickerel are abundant.

Parks, Forests, and Other Places of Interest.

Green Mountain National Forest, with headquarters at Rutland, extends from its highest peak, Mt. Ellen, to the Massachusetts line. Comprising more than 630,000 acres, it follows the main range, or backbone, of the Green Mts., with a short break at Shelburne Pass. The 260-mi. footpath called the "Long Trail" traverses much of the forest, dotted by points of historic interest dating from the Revolutionary and French and Indian wars. The State Department of Forests and Parks operates thirty campgrounds that offer winter and summer sports facilities, scenic views, and historic sites. Among them are Allis State Park, near Brookfield; Ascutney, near Windsor; Bomoseen, near Fair Haven; Branbury, near Brandon; Brighton, near Island Pond; Burton Island, near Saint Albans Bay; Burton Bay, near Vergennes; Lake Carmi, near East Franklin; D.A.R., near Addison; Darling, near East Burke; Elmore, near Elmore; Emerald Lake, near East Dorset; Fort Dummer, near Brattleboro; Gifford Woods, near Killington; Grand

Isle, near Grand Isle; Groton, near Marshfield; Maidstone, near North Stratford; Molly Stark, near Wilmington; Mt. Philo, near North Ferrisburg; North Hero, near North Hero; Quechee, near Hartford; Saint Catherine, near Poultney; Silver Lake, near Barnard; Wilgus, near Ascutney; and Woodford, near Woodford. State forests include Calvin Coolidge State Forest, near Woodstock; Mt. Mansfield, near Stowe; Thetford Hill, near Thetford; and Townshend, near Newfane.

Among the natural wonders of Vermont are the Cave of the Winds, near the top of Mt. Mansfield, and Moss Glen falls and chasm, near Stowe. Points of historic interest include the State House in Montpelier; the Bennington Battle Monument; the birthplace and grave of Calvin Coolidge (q.v.), thirtieth President of the U.S., in Plymouth; the birthplace of Chester A. Arthur (q.v.), twenty-first President of the U.S., in Fairfield; the site of the Battle of Hubbardton, the only battlefield on Vermont soil; the Smith Monument, at the birthplace of Joseph Smith (q.v.), founder of Mormonism; and the Old Constitution House in Windsor, where Vermont became the fourteenth State of the Union.

Sports. A number of historic trout rivers, including the Battenkill, White, Willoughby, and Mad rivers, and many lakes and ponds provide

VERMONT

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○ County seat.

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(river)	A 4
Black (river)	B 3

fine fishing in Vermont. Some of the species of gamefish found are landlocked salmon, largemouth and smallmouth bass, walleye and northern pike, bluegill, yellow perch, bullhead, chain pickerel, muskellunge, and four varieties of trout. Game animals and birds hunted are white-tailed deer, black bear, cottontail rabbit, showshoe hare, gray squirrel, ring-necked pheasant, ruffed grouse, puddle duck, diver, Canada goose, and woodcock. Vermont has more than forty ski areas. Snow on some runs averages up to 10 ft. in depth, and skiing may last until May. Among popular areas are Stowe, Glenn Ellen, Sugarbush, Mt. Snow, Big Bromley, Killington, Stratton, Jay Peak, and Pico Peak.

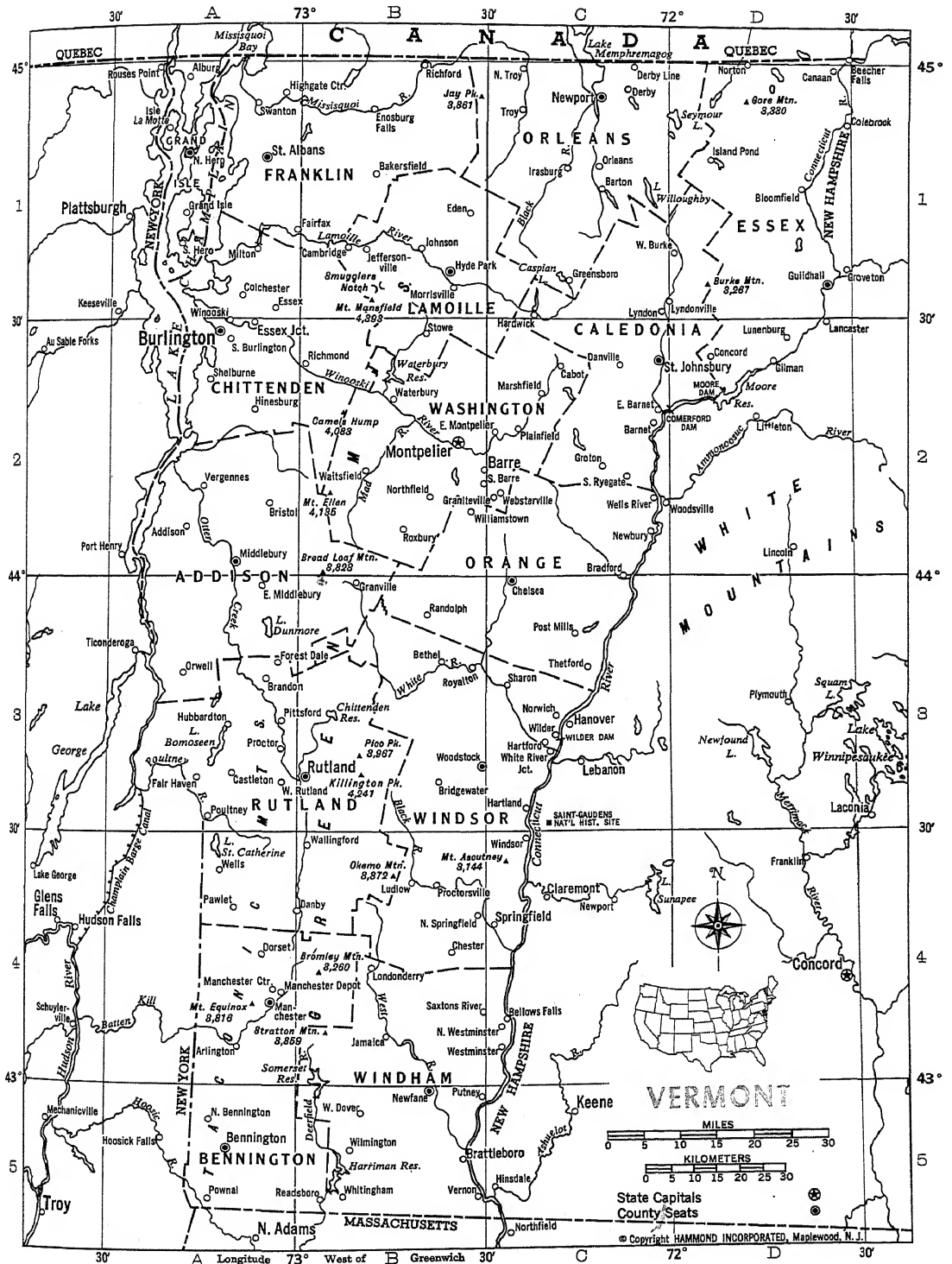
THE PEOPLE

According to the 1970 decennial census, the population of Vermont was 444,330, an increase of 14.1 percent over the 1960 population. The urban segment comprised 142,889 persons, 32.2 percent of the total, compared with 28.5 percent in 1960. The rural segment comprised 301,441 persons, 67.8 percent of the total, compared with 61.5 percent in 1960. Ethnically, the 1970

population was distributed as follows: white persons, 442,553; nonwhites, 1777, including a number of Negroes, Japanese, Chinese, Indians, Filipinos, and others. The percentage of native-born residents was 95.8; of foreign-born, 4.2. The major country of origin of the foreign-born was Canada. The 1970 population density averaged 47.9 per sq.mi., compared with 42.0 per sq.mi. in 1960.

The chief cities are Montpelier, the capital, a printing, insurance, and commercial center and trade point for an agricultural area; and, in order of population, Burlington, an industrial and trading center, the seat of the University of Vermont; Rutland, center of marble quarrying and gateway to varied tourist attractions; Bennington, a commercial and manufacturing center, the seat of Bennington College; Brattleboro, a printing and textile center and winter resort; and Barre, a granite-quarrying center.

Education. The public-school system of Vermont was established in 1777. Education is compulsory for all children between the ages of seven and sixteen.





Left: The statue of Ethan Allen, a famous Vermonter and hero of the American Revolution, stands outside the Statehouse in Montpelier, the State capital. Below: The Bennington Monument commemorates an American victory over British forces during the Revolutionary War.

Vermont Development Dept.



ELEMENTARY AND SECONDARY SCHOOLS. In the early 1970's public elementary schools numbered about 355 and public secondary schools, about 65. Enrollment was about 76,000 in elementary and about 29,000 in secondary schools. Teachers in the public-school system numbered about 3185 in elementary and about 3120 in secondary schools. Private institutions included about 30 elementary schools with some 9000 students, and about 25 secondary schools with some 7000 students. Teachers in private schools numbered about 900.

UNIVERSITIES AND COLLEGES. In the early 1970's university and college enrollment was about 23,000. The State had seventeen institutions of higher learning, twelve of which were private. Public institutions include the University of Vermont and State Agricultural College, and State colleges at Castleton, Johnson, and Lyndon. Private institutions include Bennington College (q.v.), Middlebury College, Norwich University, Saint Michael's College, and Trinity College.

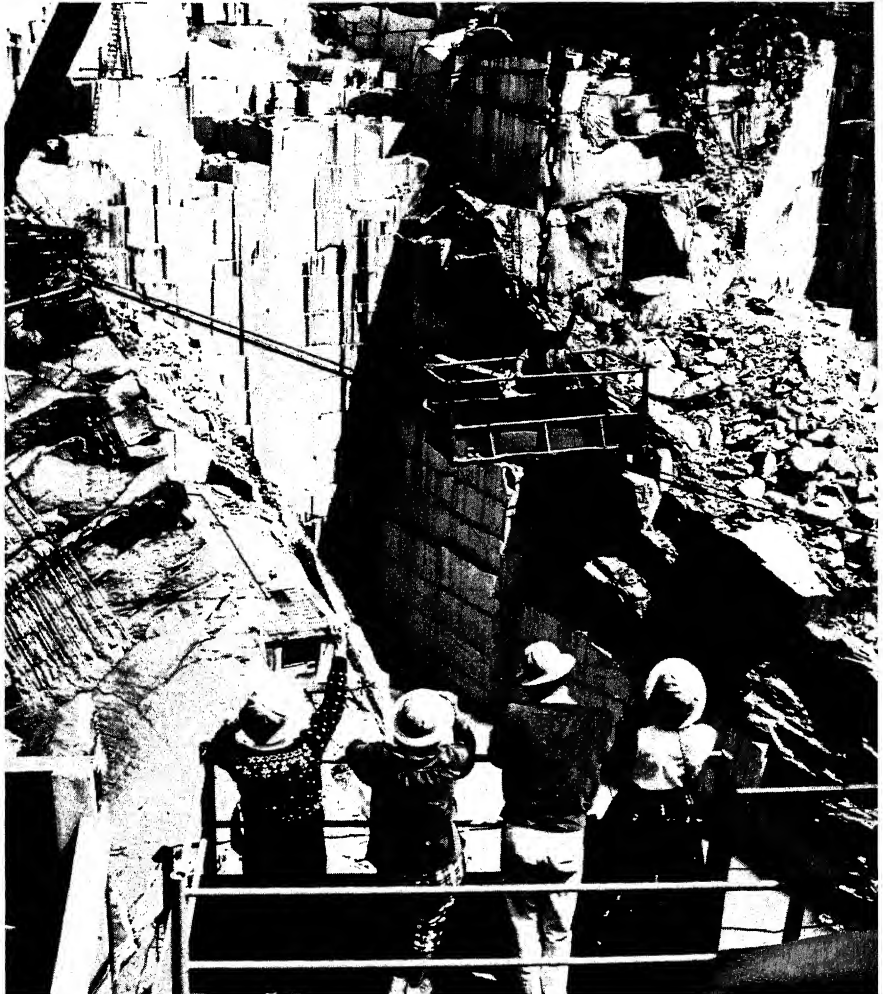
One of the famous granite quarries of Vermont, at Barre.

Vermont Development Dept.

Libraries and Museums. Vermont has the oldest library system in the U.S.; virtually every town in the State has a local library. Cultural institutions include the Bennington Museum, with a historical collection; the Robert Hall Fleming Museum of the University of Vermont, Burlington; the Walker Museum, in Fairlee, with mechanical exhibits and an art collection including Iranian, Balinese, and Japanese works; the Sheldon Museum, in Middlebury; the Norwich University Museum, in Northfield, with exhibits of military relics; the Fairbanks Museum of Natural Science, with a planetarium, and the Athenaeum Art Gallery, both in Saint Johnsbury; the Miller Art Center, in Springfield, which emphasizes local history and primitive portraits; and the Vermont Historical Society Museum, in Montpelier, with exhibits featuring Vermont history, geology, flora, and fauna.

THE ECONOMY

Vermont has a diversified economy. Per capita personal income was \$5480 in 1976, compared



VERMONT

with \$6441 for the U.S. as a whole. Agriculture employs about 8 percent of the State's workers and mining somewhat more than half of 1 percent. Nonagricultural workers are employed, in descending order of numbers, in manufacturing; service industries; wholesale and retail trade; government; transportation and public utilities; construction; and finance, real estate, and insurance. Recreation areas, particularly for winter sports, fishing, hiking, and camping, attract many tourists, who spend about \$320,000,000 annually.

Manufacturing. According to a recent survey of manufactures, production workers in Vermont total about 28,000. The largest groups are employed in the manufacture of nonelectrical machinery and wood products and in printing and publishing. The manufacture of paper, of stone, clay, and glass products, and of food products is also important. Burlington, Rutland, and Springfield are the most important manufacturing centers. The value added by manufacture (see **VALUE**) in the largest industries in the mid-1970's was about \$147,000,000 annually for nonelectrical machinery, \$74,100,000 for fabri-

cated metal products, and \$73,100,000 for printing and publishing. The annual value added by all manufacturing in the State was about \$781,600,000.

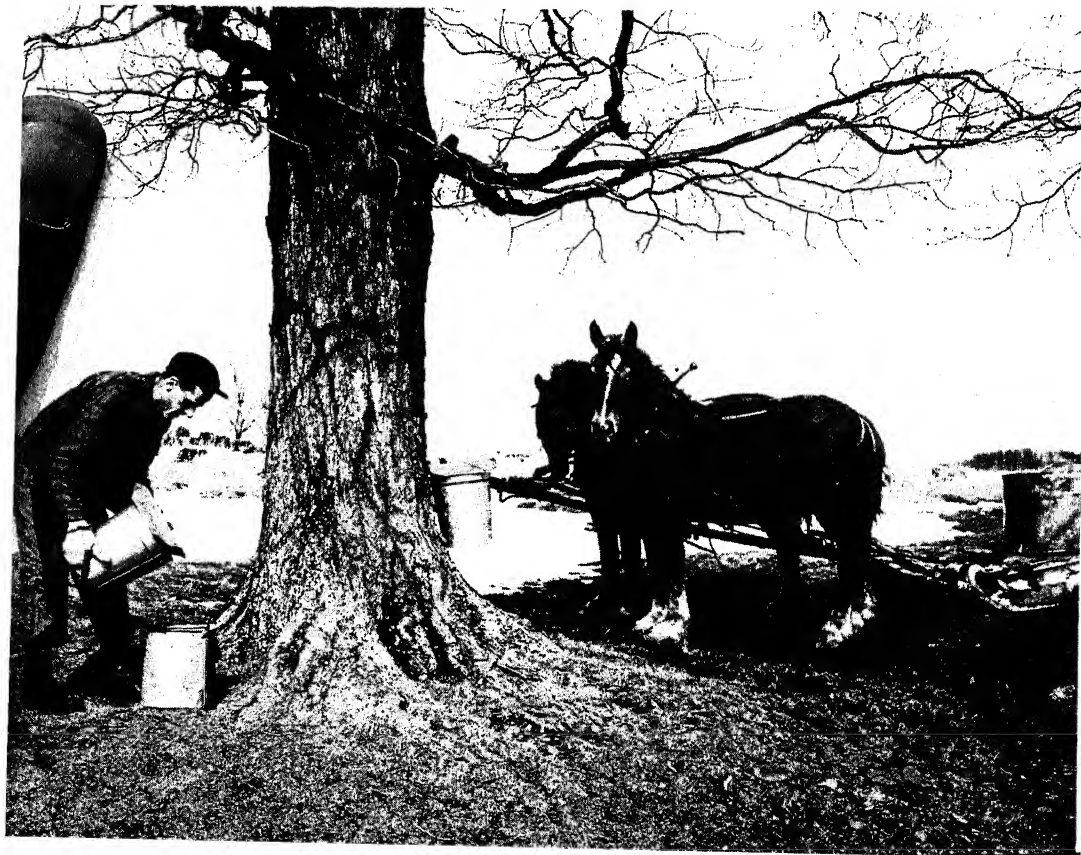
Agriculture. Vermont's most valuable agricultural products, in descending order, are milk, cattle, eggs, and apples. Also important are hay and potatoes, and forest products such as maple syrup and Christmas trees. There are some 6600 farms in Vermont, covering about 1,860,000 acres; the average size of a farm is 282 acres. Vermont ranked forty-third among U.S. States in the mid-1970's in total value of cash receipts from agriculture, with about \$263,000,000 annually. Of the total, \$245,000,000 came from livestock and \$18,000,000 from crops.

Mining. Mining and quarrying are important industries in Vermont. The State's most valuable minerals are stone (particularly granite and marble), sand and gravel, lime, and clays. The State is a leading producer of asbestos, talc, and soapstone. The total annual value of mineral production in Vermont in the mid-1970's was about \$29,000,000. Vermont ranked forty-seventh in the U.S. in mineral production.

Energy. Generating plants in Vermont, with a capacity of 900,000 kw, produced about 4.4 billion kw hours of electrical energy annually in

Gathering sap in a maple orchard. Vermont is the leading U.S. producer of maple syrup.

Vermont Development Dept.



the mid-1970's. About 2 percent of production and 9 percent of capacity were publicly owned. Among Vermont's power sources are a nuclear energy reactor at Vernon and a hydroelectric installation at Vernon Dam on the Connecticut R. between Vermont and New Hampshire. The State's utilities also buy power from New York sources.

Forestry. The lumber industry is of major importance to Vermont. Commercial forest land, about three quarters of which consists of hardwoods, amounts to some 4,350,000 acres and is primarily under private ownership. It produces a net annual cut of sawtimber of approximately 163,000,000 bd.ft. The major softwood-producing region is in the counties of Essex, Caledonia, and Orleans.

Transportation. The first railroad in Vermont was the Vermont Central Railroad, a spur of the Canadian Pacific Railway, inaugurated on June 26, 1848. At present the State is served by several major railroads with about 767 mi. of track. Rural and municipal roads total about 13,900 mi., and Federally assisted primary and secondary highways total 3791 mi., including 320 mi. in the Interstate Highway System. One international airline and 5 local and interstate airlines operate in Vermont; there are about 13 public and 49 private airports. The chief commercial waterways are Lake Champlain, which is connected in the north with the Saint Lawrence R., and Champlain Canal, which has access from Lake Champlain and is a part of the New York State Barge Canal, connected with the Hudson R.

Communications. The first newspaper in Vermont was the *Vermont Gazette*, or *The Green Mountain Post Boy*, founded in Westminster in 1781. Today the State has about 8 daily newspapers and 2 Sunday papers. Among the leading papers are the *Burlington Free Press* and the *Rutland Herald*. There are about 45 radio stations and 3 television stations in Vermont. One of the oldest radio stations in the State is WSYB, Rutland, which began broadcasting in 1930.

GOVERNMENT

Vermont is governed under the constitution of 1793, as amended. Executive authority is vested in a governor, a lieutenant-governor, an attorney general, and a secretary of state, all elected for two-year terms, and other elected and appointed officials. Legislative authority is exercised by the General Assembly, consisting of the Senate with 30 members and the House of Representatives with 150 members, all elected for two-year terms. The legislature meets biennially in odd-numbered years. The judicial system includes a five-member supreme court and

various trial courts. The State has fourteen counties and seventy-two districts, the latter determined on the basis of numbers of registered voters.

Vermont is represented in the United States Congress by two Senators and one Representative.

Voting Qualifications. Suffrage is extended generally to U.S. citizens eighteen years of age who have resided 90 days in the State, county, and election district.

HISTORY

The first explorer of the Vermont region was Samuel de Champlain (q.v.), who in 1609 journeyed to the lake later named for him. No settlements were made until 1665, when the French built Fort Saint Anne on Isle la Motte in Lake Champlain. In 1724 the first permanent English settlement, Fort Dummer, was established on the site of Brattleboro by the Massachusetts Bay Colony, and in 1728 a trading post was opened there. Both the French and English built numerous forts in the region, and during the French and Indian War (q.v.) many battles were fought there. In 1757 the French abandoned all posts in Vermont except for Isle aux Noix, which was taken the following year by the British.

Boundary Disputes. The Vermont area was claimed by both the New York and New Hampshire colonies. New Hampshire claimed jurisdiction over all territory lying within 20 miles east of the Hudson R. New York, challenging New Hampshire's claim, asserted its own claim to the territory lying west of the Connecticut R. Starting in 1749, New Hampshire's royal governor, Benning Wentworth (1696-1770), issued lavish grants in the area claimed by New York. In all, 131 such grants were issued between 1749 and 1764. In the latter year, a royal decree declared the Connecticut R. the boundary between New Hampshire and New York. The New York government considered this to mean that the New Hampshire grants were annulled, and ordered the settlers to repurchase them from New York. This order was generally refused by the settlers. A second royal order, in 1767, forbade the granting of disputed lands until further instructions were received from the crown. New York, however, continued to grant the lands not previously repurchased. A convention of settlers held at Bennington determined that the settlers were to resist by force any processes of the New York courts to eject people holding New Hampshire charters. In 1770 the grand jury at Albany, N.Y., indicted as rioters some of the settlers who had attended the convention, and



The Windham County courthouse at Newfane. In the foreground is a monument to the men of Vermont who fought in the Civil War.

Vermont Development Dept.

several were arrested in 1771. To protect themselves, the settlers in the several towns formed committees of safety, and it was decreed that no New York officer should take anyone out of the district without the consent of the committee. To enforce these rules, a group called the Green Mountain Boys (q.v.) was formed under the leadership of Ethan Allen (see *under* ALLEN) and others. In April, 1775, a convention met at Westminster and proclaimed the territory independent of New York, but declared itself willing to await the king's pleasure as to whether Vermont should become a separate province or be annexed to some other province.

Wars. The first aggressive act of the American colonists during the American Revolution (q.v.) occurred on May 10, 1775, when Ticonderoga (q.v.) was captured by the Green Mountain Boys. Under their own leaders the Vermont colonists waged practically a separate war against the British and their Indian allies. In January, 1776, a convention at Dorset sent a commission to the Continental Congress to request that Vermont be made a separate State; the Congress refused. The following year another convention met at Westminster, declared the territory to be

an independent State with the name New Connecticut, and again asked and was refused admission. In June, 1777, the name was changed to Vermont and a constitution similar to that of Pennsylvania was adopted, but with a clause prohibiting slavery. The constitution was drafted by the American Revolutionary patriot Ira Allen (see *under* ALLEN) and by Thomas Chittenden (1730–97), elected first governor of Vermont in 1778, both of whom were active in securing Statehood for Vermont. In 1779 New Hampshire began to press its claim to the territory, and New York renewed its claim. After the close of the Revolution, a gradual change of feeling took place in New York, and in 1789 a commission to treat with Vermont was appointed. In 1790 it was agreed that New York should cease opposing the admission of Vermont to the Union on payment by Vermont of \$30,000 for disputed land claims. This sum was soon paid, and Vermont entered the Union on March 4, 1791, the first State admitted under the Constitution of the United States (q.v.). New Hampshire's claims had been settled in 1782, when it was decided that the eastern boundary of Vermont was to cover 200 mi. along the Connecticut R. and the New Hampshire boundary was to extend to the original low-water line on the west bank of the river.

During the War of 1812, soldiers from Vermont took part in a number of battles, and one engagement was fought on Vermont soil in 1813. After 1825 there was considerable emigration from the State, but numbers of French Canadians settled in Vermont to replace the emigrants. Vermont furnished the Union with more than its quota of soldiers during the Civil War.

In the early 1900's Vermont's agricultural economy rapidly gave way to increasingly important manufactures in such areas as the granite industry, lumber processing, and cheesemaking. At the same time, tourism became a major source of revenue. Despite efforts to promote industrial development over the decades, Vermont's production scale as a whole has remained relatively small. Still dependent on tourism, Vermont today seeks ways to encourage this trade, while also maintaining its strict conservation policy protecting the State's wilderness areas.

VERMOUTH, white wine, fortified with additional alcohol and aromatized with spices, roots, seeds, flowers, leaves, bark, and herbs. It contains from 15 to 20 percent alcohol and is used mainly as an aperitif or in cocktails. The pale, dry variety is called French vermouth and the dark, sweet variety is known as Italian vermouth.

VERNE, Jules (1828-1905), French author, born in Nantes. He studied law in Paris and from 1848 until 1863 wrote opera librettos and plays. In 1863 he achieved his first real success with the publication of *Cinq Semaines en Ballon* ("Five Weeks in a Balloon"), a short fantasy that anticipated Verne's later work. Regarded as the father of the literary genre known as science fiction (q.v.), Verne rode a wave of 19th-century interest in science and invention to enormous popular favor.

Laying a carefully documented scientific foundation for his fantastic adventure stories, Verne forecast with remarkable accuracy many scientific achievements of the 20th century. He anticipated flights into outer space, navigable submarines, helicopters, air conditioning, guided missiles, and motion pictures long before they were developed. Among his most popular books, all of which have been translated into English, are *Voyage au Centre de la Terre* ("Journey to the Center of the Earth", 1864); *De la Terre à la Lune* ("A Trip to the Moon", 1865); *Vingt Mille Lieues Sous les Mers* ("20,000 Leagues Under the Sea", 1870); *L'île Mystérieuse* ("Mysterious Island", 1870); *Le Tour du Monde en Quatre-vingts Jours* ("Around the World in Eighty Days", 1872); and *Michel Strog-*

off ("Michael Strogoff", 1876). Beginning with a remarkable motion picture of *A Trip to the Moon* by the French director Georges Méliès (1861-1938), Verne's works have been the source of many films. American film versions of *20,000 Leagues Under the Sea* (1954), *Around the World in Eighty Days* (1956), and *Journey to the Center of the Earth* (1959) have been popular. **VERNER'S LAW**, phonetic law concerning the Teutonic group of the Indo-European languages (q.v.), formulated in 1875 by the Danish philologist Karl Adolph Verner (1846-96). The law is fundamentally an explanation of certain questions or exceptions growing out of Grimm's Law (q.v.), the earlier, significant elucidation of the so-called German consonant shifts that occurred between 2000 B.C. and 700 A.D. Apart from clarifying these irregularities, Verner's Law was historically important in establishing the principle of phonetic laws on a scientific basis.

Essentially, Verner's Law explains the puzzling evolution, in Proto-Germanic, of medial or final voiceless fricatives, that is, those not beginning a word, into voiced or sonant fricatives; see GERMAN LANGUAGE; PHONETICS. The law attributes the phenomenon to the fact that, in the antecedent Proto-Indo-European, the analogues of these sounds had followed an unaccented, or secondary-accented, syllable; such accentuation, Verner surmised, must once have been part of prehistoric German, only to be lost later. Thus, in Proto-Germanic, noninitial *f*, *th*, *x*, and *s* (corresponding to Proto-Indo-European *p*, *t*, *k*, and *s*) became the voiced fricatives *b*, *d*, *g*, and *r* when following a syllable that did not bear the primary accent in the particular word. Applications of Verner's Law can be noted in English today, for example, in the different endings of the words "death", "dead", "was", and "were".

The consonant changes described in Verner's Law were apparently operative between 250 B.C. and 400 A.D., after completion of the first Germanic sound shifting indicated in Grimm's Law. Enough of a pattern is established in Verner's theory to justify belief that the Teutonic languages retained the Indo-European system of free accent as late as the beginning of the Christian era. Only later did the Germanic languages confine the main accent of a word to the root syllable, in contrast to Vedic Sanskrit, Greek, Russian, and Lithuanian.

See also LANGUAGE; PHILOLOGY; PHONETIC LAW; VOICE AND SPEECH.

VERNON, city in Texas, and county seat of Wilbarger Co., about 43 miles N.W. of Wichita Falls. Oil and gas are natural resources of the area, which is also rich in cattle, grain, and cot-

VERONA

ton. A commercial and transportation hub, the city has meat-packing plants and manufactures athletic equipment. Founded in 1880 as a trail town, the city was incorporated in 1890. Pop. (1960) 12,141; (1970) 11,454.

VERONA, borough of New Jersey, in Essex Co., about 4 miles N.W. of Bloomfield. Important manufactures of the borough include brushes and abrasives. Founded in 1730, Verona was incorporated as a borough in 1907. Pop. (1960) 13,782; (1970) 15,067.

VERONA, city of Italy, in Venetia Region, capital of Verona Province, on the Adige R., 71 miles W. of Venice. The city is strategically located on the route from Milan to Venice and from Italy to central Europe via the Brenner Pass. It is an important railroad and marketing center. Industries include printing and the manufacture of textiles, machinery, paper, drugs, and shoes. Verona is famed as the site of many architectural landmarks. Noteworthy are the Romanesque basilica of San Zeno Maggiore (9th–12th centuries), the Gothic Church of Sant'Anastasia (1261–1422), the magnificent 16th-century palaces of Bevilacqua, Canossa, and Pompei, and the Castel Vecchio (1354), now a museum. Among other features of the city are the great piazzas, or squares, that are surrounded by fine examples of medieval and Renaissance architecture. Housed in the city is the ruin of a Roman amphitheater dating from the first century A.D.; it is still used for open-air municipal concerts. Verona was the birthplace of several famous men, including the Roman poet Gaius Valerius Catullus and the Italian painter Paolo Veronese (q.v.).

History. Once an Etruscan village, Verona became a Roman possession in 89 B.C. During the Middle Ages it was a military stronghold and a commune. The city reached the height of its political and artistic prominence in the 14th century, under Ghibelline rule (see GUELPHS AND Ghibellines). Conquered by Venice in 1405, Verona was a part of the Venetian Republic until 1797, when it was occupied by the French forces of Napoléon Bonaparte, later Emperor Napoleon I (q.v.). Not long afterward it passed to Austrian control. Verona became a part of the Kingdom of Italy in 1866.

Population. (1971) 264,363.

VERONESE, Paolo, real name PAOLO CAGLIARI or. PAOLO CALIARI (1528–88), Italian painter, born in Verona. In 1553 he settled in Venice, and by the mid-1550's, he was painting frescoes for the Doge's Palace and for the sacristy of the Church of San Sebastian, both within the city. Veronese made several trips to Rome,

the first occurring around 1560, and the influence of the Roman school on his style was marked. From 1577 until his death he worked on the restoration of the Doge's Palace.

Veronese, together with his two contemporaries Titian and Il Tintoretto (q.v.), is considered a master of the Venetian school of art, portraying in his paintings the richness and grandeur of 16th-century Venice; see VENETIAN SCHOOL OF PAINTING. Many of Veronese's works are grandiose scenes concerned with themes of religion and history, for example, "Feast in the House of Levi" (1573?, Accademia di Belle Arti, Venice), and "Wedding at Cana" (1562–63, Louvre, Paris). He also dealt with mythological or allegorical themes, as "Mars and Venus" (1575, Metropolitan Museum of Art, New York City) and "Allegory of Wisdom and Strength" (about 1580, Frick Collection, New York City).

Criticism. Veronese's work is large, full of bright Venetian light, crowded with figures, and bursting with action. His secular approach to religious themes, typified by his inclusion of animals and unkempt soldiers in his paintings, caused him to be charged by the Inquisition (q.v.) in 1573 with having contaminated his religious subjects by introducing sensual and profane elements into his work. He claimed the right of artistic freedom, thus becoming one of the first artists to defend pictorial license.

VERONICA. See SPEEDWELL.

VERONICA, Saint, according to legend, a woman who met Jesus Christ on His way to Calvary (q.v.) and offered Him her veil to wipe the sweat from His brow. When He had done so the divine features became imprinted upon the veil. The legend, probably of French origin, is found in its present form in the 14th century. A portrait said to bear the impression of Christ's features that appeared on the veil and apparently dating from the 8th century was venerated in Rome throughout the Middle Ages (q.v.); it was exhibited in Saint Peter's Basilica (q.v.) on Dec. 8, 1854. Milan and various other places dispute with St. Peter's the possession of the relic. See also STATIONS OF THE CROSS.

VERRAZANO, Giovanni da or **VERRAZZANO, Giovanni da** (about 1480–1527?), Italian navigator, born in Val di Greve, near Florence. Entering the French maritime service, he became famous as a corsair in raids on Spanish ships. He was commissioned by Francis I (q.v.), King of France, to claim new lands for France and to seek a western sea route to China. In 1524 he reached the coast of present-day North Carolina and then explored the Atlantic coast as far north as present-day Nova Scotia. He was the first Eu-

An equestrian statue of the Venetian condottiere Bartolommeo Colleoni (1400–75). Designed by Andrea del Verrocchio in 1488, the monument stands on the Campo dei Santi Giovanni e Paolo, a square in the center of Venice. Alinari



ropean to enter what is now New York Bay. While on a second expedition Verrazano was killed by Indians in Brazil. See NORTH AMERICA: *History: French and English Colonization.*

The Verrazano-Narrows Bridge in New York Harbor between Brooklyn and Staten Island is named after him.

VERROCCHIO, Andrea del or **VEROCCHIO, Andrea del**, real name ANDREA DI MICHELE CIONE (1435–88), Florentine sculptor and painter, born in Florence. According to tradition, he was trained in that city as a goldsmith, with Giuliano Verrocchio whose name he supposedly adopted as his own; as a sculptor, with Donatello (q.v.); and as a painter, with Aessio Baldovinetti (1425?–99). Later Verrocchio conducted a large academy in Florence which became the principal center in the arts he practiced. Among his pupils were Leonardo da Vinci, Sandro Botticelli, Lorenzo di Credi, and Il Perugino (qq.v.).

Verrocchio is ranked second only to Donatello among the Italian sculptors of the early Renaissance; see RENAISSANCE ART AND ARCHITECTURE. His equestrian statue of the Venetian condottiere Bartolommeo Colleoni (1400–75), which stands in the Piazza di SS. Giovanni e Paolo in Venice, is notable for the impression it creates of nobility and power, and for the con-

summate mastery of the anatomical and technical problems involved. Verrocchio completed only the clay model for this work, which was cast after his death by the Venetian sculptor Alessandro Leopardi (d. about 1522). Other major sculptures include the statue "David" (1470–72, Museo Nazionale, Florence) and "Boy with a Dolphin" (1476?, for a fountain in the courtyard of the Palazzo Vecchio, Florence).

Most of the paintings once attributed to Verrocchio probably were executed by his pupils after his designs. The few paintings that exhibit his personal style are distinguished by firm drawing and modeling and enamel-like color. His landscapes particularly reveal him as a pioneer in the rendition of atmospheric perspective. Among the principal paintings attributed to him are "Baptism of Christ" (1470, Uffizi Gallery, Florence) and "Madonna and Child" (probably not later than 1475, Staatliche Museen, Berlin). Recent studies of the "Baptism of Christ" have confirmed that one of the angels and part of the background are the work of Leonardo da Vinci.

VERSAILLES, city of France, capital of Yvelines Department, 10 miles s.w. of Paris. It is primarily a residential community and is noted as the site of the palace and gardens of King Louis XIV (q.v.). The core of the palace is the small châteaueau (1624–26), built for King Louis XIII (q.v.)



The chateau with its fountain is the core of the palace at Versailles.

Air France

and later enlarged. Construction of the main edifice began in 1661; Louis XIV, his court, and the various departments of government occupied it in 1682. During the 1680's the great north and south wings were added. The overall length of the western facades is 1900 ft. The front of the palace faces a large court containing statues of famous Frenchmen. Numerous galleries, salons, and royal apartments, all lavishly decorated and fitted with ornate furnishings, occupy the interior. One of the most famous galleries is the Hall of Mirrors, the walls of which are covered with enormous looking-glasses. The chief architects of Versailles were Louis Le Vau (1612–70) and his successor Jules Hardouin-Mansart (1646–1708).

The gardens designed by the French landscape architect André Lenôtre (1613–1700), are laid out in broad avenues lined with trees, shrubbery, and groups of sculpture. There are numerous secluded groves and a mile-long Grand Canal. Particularly noteworthy is the Orangery, considered one of the finest single pieces of architecture in Versailles. Also outstanding are the magnificent fountains, supplied by a water system almost 100 mi. in length. Beyond the gardens to the north are the Grand and Petit Trianons or royal villas. The Petit Trianon was a favorite retreat of Marie Antoinette, Queen of France and wife of King Louis XVI (qq.v.).

The palace, designated a national museum in

1837, was the site of many historic events. In 1789, on the Tennis Court, the Estates General of France took the famous oath which heralded the beginning of the French Revolution (q.v.). During the Franco-German War (1870–71), German headquarters were located in the town of Versailles and William I (q.v.) was proclaimed emperor of Germany at a ceremony held in the palace on Jan. 18, 1871. Subsequently, during the Third Republic, it was the seat of the French National Assembly until 1879. After World War I the Versailles Treaty was signed in its Hall of Mirrors. Pop. (1968) 94,915.

VERSAILLES, TREATY OF, peace treaty signed at the end of World War I between Germany and the Allies. The treaty was negotiated during the Paris Peace Conference held in Versailles beginning Jan. 18, 1919. Represented at the conference were the United States, Great Britain, France, and Italy; the German Republic, which had replaced the imperial German government at the end of the war, was prohibited from the parley. The treaty contained the establishing covenant for the League of Nations, detailed the disarmament of Germany and the reparations to be made by her, and provided for postwar territorial adjustments on the European continent and in Germany's colonial empire. It was signed on June 28, 1919, in the Hall of Mirrors at the Palace of Versailles near Paris. The U.S. did not ratify the agreement but signed a separate Treaty of Berlin with Germany on July 2, 1921; see UNITED STATES OF AMERICA, THE: *History: Between the Two World Wars*.

The League of Nations. The covenant of the League of Nations, history's first worldwide peace-keeping body, was drawn up at the Paris Peace Conference and was included as the first part of the Treaty of Versailles. The league had as its long-term goals the mediation of all international disputes and the promotion of international cooperation. It was given immediate responsibility for executing the terms of the various treaties negotiated following World War I and for supervising the administrations, called mandates (q.v.), of former German and Turkish possessions. See LEAGUE OF NATIONS.

Disarmament and Reparations. By the Treaty of Versailles, Germany was required to abolish compulsory universal military service; to reduce her army to 96,000 men and 4000 officers, recruited by voluntary enlistment; to demilitarize all the territory on the left bank of the Rhine R. and also that on the right bank to a depth of 93 mi.; to stop all importation, exportation, and nearly all production of war material; to limit her navy to 6 battleships, 6 light cruisers, and 12 torpedo boats, with no submarines, the naval personnel not to exceed 15,000 officers and men; and to abandon all military and naval aviation by Oct. 1, 1919. The execution of most of these provisions was to be supervised by an inter-Allied Commission of Control endowed with full powers of inspection and investigation. In addition, Germany agreed to demilitarize the island of Helgoland, to open the Nord-Ostsee Canal (q.v.) to all nations, to surrender her fourteen submarine cables, and to permit the trial of her ex-emperor William II (q.v.) by an international high court on the charge of "a supreme offense against international morality", and of other officials for violation of the laws and customs of war.

For damage incurred by the Allied powers during the war, Germany was required to make extensive financial reparation. In addition to money, payment was made in the form of ships, trains, livestock, and valuable natural resources. Difficulty arose in collecting payment, and the situation was not finally settled until the Lausanne Conference in 1932; see REPARATIONS.

Territorial Changes. Germany recognized the unconditional sovereignty of Belgium, Poland, Czechoslovakia, and German Austria, denounced the treaties of Brest Litovsk (see BREST LITOVSK, TREATY OF) and Bucharest, and agreed to allow the Allies carte blanche in dealing with the newly-formed Soviet Union, Turkey, Bulgaria, Hungary, and Austria. In addition, she lost 27,500 sq.mi. or slightly more than 13 percent of her European domain. Alsace-Lorraine was re-

turned to France, and the Saar Basin placed under a League of Nations Commission for fifteen years. Belgium received the small districts of Eupen, Malmédy, and Moresnet. Under plebiscites held in February and March, 1920, to determine the status of northern and central Schleswig, the former, comprising 1537 sq.mi., was reunited with Denmark, but the latter remained with Germany. To Poland were ceded large parts of the provinces of Posen and west Prussia. In July, 1920, plebiscites in southeastern Prussia and the Marienwerder district of west Prussia produced substantial majorities for Germany. The plebiscite in Upper Silesia in March, 1921, gave a majority for Germany, but the Council of the League of Nations, having been invited to settle the controversy, awarded the richest part of the region, 12 sq.mi., to Poland. A portion, 110 sq.mi., of Upper Silesia was ceded to Czechoslovakia on July 28, 1920. The port of Memel with adjacent territory was ceded to the Allies for ultimate transfer to Lithuania. The port of Danzig was ceded to the principal Allied and associated powers, which recognized Danzig as a free city administered under the League of Nations but subject to Polish jurisdiction in regard to customs and foreign relations.

Germany also lost her entire colonial empire. She renounced all special rights and privileges in China, Egypt, Siam, Liberia, Morocco, and Turkey. Her rights and privileges in Shantung were ceded to Japan. Germany ceded to the Allied powers all remaining overseas possessions which in accordance with Article 22 of the League of Nations Covenant were to be administered by mandates of the league.

See also DISARMAMENT; GERMANY: *History*.

VERSE, one or more lines of metrical composition, as distinguished from prose. See POETRY; VERSIFICATION.

VERSIFICATION, art of making verses or the theory of the phonetic structure of verse. This theory considers the phonetic characteristics of verse both as absolute elements and as relative to the other, nonphonetic elements of verse.

Theoretically, any phonetic characteristics of a language, such as the number of syllables in an utterance, the degrees of energy or lengths of time taken to utter them, or even their pitch (q.v.), may be organized into an orderly and symmetrical pattern. The study of versification in the poetry of different languages and periods must take many of these possibilities into account.

ENGLISH VERSIFICATION

In the English language the basic system of versification is known as accentual-syllabic. In this

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system the constituents of the fundamental pattern of versification are the number of syllables to the line of verse and the arrangement of these syllables according to whether they are pronounced with a greater or less degree of energy, that is, whether they are accented or unaccented; see ACCENT. Thus, in English poetry of almost all periods, the verse structure is created both by fixed or varying numbers of syllables per line and by constant alternation of accented and unaccented syllables in definite, recurring sequences within each line.

The Foot. In accentual-syllabic versification the basic unit of measurement is known as the foot. The foot consists of one accented syllable accompanied by one or two unaccented syllables. According to the particular pattern chosen, the accented syllable may precede or follow either one or two unaccented syllables in a regularly recurring sequence throughout the line, as in the following example, in which the accented syllables are marked $\acute{}$, the unaccented are marked ˘ , and the divisions between the units of accented and unaccented syllables are marked $/$.

$\text{B\acute{u}t t\acute{a}r/ri\acute{e}s y\acute{e}t / th\acute{e} C\acute{a}u\acute{s}e / f\acute{o}r wh\acute{i}ch / H\acute{e} d\acute{i}ed.$

In each foot of the example above, one unaccented syllable precedes one accented syllable. This type of foot, called the iamb or iambic foot, is the most common in English verse. The other principal types of foot found usually in English verse are :

trochee or trochaic foot	$\text{˘} \text{ } \acute{}$
anapest or anapestic foot	$\text{˘} \text{ } \text{˘} \text{ } \acute{}$
dactyl or dactylic foot	$\acute{ } \text{ } \text{˘} \text{ } \text{˘}$

The Line. In addition to accent, the number of syllables to a line is an important determinant of the theoretical pattern of English verse. This syllabic pattern, or meter, is expressed usually in terms of the number of feet to a line. The example given previously contains five feet and is known therefore as a pentameter (Gr. *penta*, "five") line. Iambic pentameter is the commonest type of verse line in English. Other types of line met with frequently in English verse are:

dimeter	two feet
trimeter	three feet
tetrameter	four feet
hexameter	six feet

These lines may be found illustrated in the accompanying table.

Although each verse line often contains the same number of feet, poets also employ lines varying in length either according to a definite scheme or, less frequently, according to expressive need.

Rhyme. Another and more obvious way to create a pattern among the various lines of a poem is by the use of rhyme (q.v.), or identity of sound. Most poems make use of end rhyme, or identity of sound at the ends of lines.

Rhyme is established between two or more words or phrases in respect (1) to the vowel of the last accented syllable and (2) to all the sounds following this vowel. Thus, for example, lines rhyme if they end in "oar" and "more", or in "table" and "fable", or in "tenderly" and "slenderly". All of these are so-called perfect rhymes. Imperfect rhymes are those in which the phonetic identity is not complete, as in *love* and *remove*. Such rhymes sometimes are used to avoid monotony or to support some other purpose in a poem; except in some recent poetry, they do not form part of the regular pattern. Similarly, internal rhyme, that is, rhyme partially or wholly within the line, is not a regular constituent; it is used to vary the pattern of groups of lines in modern English verse. The following is an example of partial internal rhyme:

*The sunlight on the garden
Harden and grows cold.*

Rhyme is found commonly in almost all periods of English verse. A notable form, which was used by Geoffrey Chaucer (q.v.) in the 14th century and became very popular in the late 17th and 18th centuries, is the couplet (q.v.), a recurring unit of two successive rhymed lines:

*Know then thyself, presume not God to scan;
The proper study of mankind is man.*

Couplets of iambic pentameter, like the above, are the most frequent in English, but iambic tetrameter couplets were popular in the Middle Ages and are used also in modern times. They are called octosyllabic couplets (Gr. *okto*, "eight"), because each line contains eight syllables:

*For his Religion it was fit
To match his learning and his wit.*

Not all English verse is rhymed. A notable type of unrhymed verse much used in English is blank verse (q.v.), or unrhymed lines of iambic pentameter. Blank verse is the basic type of verse found in the plays of William Shakespeare and in the epic poems *Paradise Lost* and *Paradise Regained* of John Milton (qq.v.).

The Stanza. When the pattern of rhymes, or rhyme scheme, extends beyond two or sometimes three lines, the entire group of rhymed lines is called a stanza. In poems containing more than one stanza, the pattern of the first

stanza is usually, although not invariably, repeated in each of the succeeding ones. The rhyme scheme of any stanza is indicated commonly by a series of letters, in which each of the recurring rhymes is designated by one letter, as in this example, in which the rhyme scheme is *abab*:

At daybreak on the hill they stood
That overlooked the moor;
And thence they saw the bridge of wood,
A furlong from their door.

Stanzas may be composed of lines of the same length or of varying length, as in the example above, in which iambic tetrameters alternate with iambic trimeters. Stanzas of four lines, like this one, are called quatrains; when the rhyme scheme and line lengths are as above, the stanzas are called ballad stanzas, because many English and Scottish ballads follow this form; see BALLAD.

Other traditional stanzaic patterns are very common in English verse. Quatrains sometimes are arranged in other rhyme schemes, such as *abba*. A stanza of seven iambic pentameter lines rhyming *ababbcc*, known as Rime Royal, was used often by Chaucer and his followers and was imitated frequently by later poets. Ottava Rima, an eight-line stanza rhyming *abababcc* which was borrowed from Italian verse by English poets of the Renaissance, subsequently became highly popular. The Spenserian Stanza of nine lines rhyming *ababbcbcc* is used throughout *The Faerie Queene* by Edmund Spenser (q.v.) and was imitated occasionally by poets of the Romantic Period; see FAERIE QUEENE, THE. The sonnet (q.v.), perhaps the most popular stanza form in English poetry, contains almost invariably fourteen lines of iambic pentameter.

Variable Elements. The actual appeal of verse to the ear depends only in part on the regular, theoretical patterns of syllables, accents, and rhyme described in the foregoing. Even if it were possible in the medium of the English language to produce an absolutely unvarying pattern in which all of the accents had the same strength, poets would consider such a pattern monotonous and avoid it. The degree and kind of departures from and additions to the basic pattern vary widely from poet to poet; in fact, such variations are one of the chief factors in the richness and diversity of the English poetic tradition.

Stress. Among the possible variations and non-patterned effects, one of the most important is stress, or differentiation in the degree of accent. Various phoneticians claim that four degrees of stress are distinguished by the ordinary speaker

of English; others claim that only two degrees are actually meaningful to the speaker and attended to by him. It is usually assumed by students of poetry, however, that degrees of stress intermediate between fully accented and unaccented syllables in a line of verse are important ingredients in its verbal music. Thus in the iambic pentameter line

1 2 3 4 5
Amid / the cīr/cle, on / the sīd/ed māst,

accents 2, 4, and 5 are strongest, 1 is weaker, and 3 is weakest. Reading this line with approximately equal stress on each accented syllable produces a monotonous, singsong effect and puts an unnatural emphasis on the less important words "Amid" and "on". In the verse of most good English poets an interplay is produced between the natural stresses of speech and the basic pattern.

Another and more obvious kind of variation in stress is produced by introducing occasionally an extra syllable or a foot differing from the regular ones in the line. In the following example, in which the theoretical pattern is iambic pentameter, the third foot is made an anapest by introducing a second accented syllable and one more unaccented syllable is added beyond the regular pattern at the end of the line:

And só / fāre wēll / to the līt/tē goód / yōu bēar
me.

A line ending with an unaccented syllable, as this one does, is said to be feminine. Lines ending in accented syllables are called masculine. In the following line, also iambic pentameter in pattern, the accent patterns of the first and second feet are reversed, producing two trochees:

Lōvé, thāt / līv ēth / and reígn/ēth ín / mý thought.

Two accented syllables or two unaccented syllables may also be substituted for a conventional iamb or trochee. A foot of two accented syllables is called a spondee, as in the first three feet of the following example, in which the theoretical pattern is actually iambic pentameter:

Rōcks, Cāves, / Lākes, Fēns, / Bōgs, Dēns, / and
shādes of death.

A foot of two unaccented syllables is called a Pyrrhic foot, or Pyrrhus, as in the fourth foot below:

Fōr thēy / ap péal / frōm tý/rān ný / to Gód.

The most extreme departure from the theoretical stress-pattern of English verse is free verse (q.v.), which is composed in lines of irregular

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length, according to expressive need, as in the verse of the American poet Walt Whitman (q.v.).

Pause. Apart from degrees and shifts of stress, another kind of variation from the theoretical pattern must be accounted for in terms of the length and phonetic character of the pauses, or intervals, between syllables of verse. Almost any particular line of iambic pentameter, no matter how regular, will depart slightly in rhythm from the absolutely regular pattern that can be produced by uttering “da-dum, da-dum, da-dum, da-dum, da-dum”. As phoneticians presently know, the character of the interval between syllables depends as much on variations in the pitch of the voice just before and just after the pause as it does on the time interval itself. Traditionally, however, poets, hearers, and readers have thought of this interval simply in terms of time. A strong pause in a line is called a caesura, indicated by double bars in the following lines of iambic pentameter:

Not marble, // nor the gilded monuments
Of princes, // shall outlive this powerful rime.

When the pause comes at the end of the line the line is said to be end-stopped, as in the second line above. When the sense of the poetic statement continues from one line into the next, however, so that no pause occurs at the line end, the first line, as in the example above, is said to be a run-on line. Such lines offer yet another opportunity for variation from the regular pattern.

Sound Quality. Like the variations in the stress of syllables and in the character of the intervals between them, a third factor independent of the theoretical pattern becomes very important in its enrichment. This factor is vowel and consonant quality. In general the quality or coloration of sounds has much to do with the effect of a line or of a poem, in ways that have not been fully investigated. Harsh sounds, for instance, like the word “harsh” itself, may suggest pain or effort; soft ones, like the word “pure”, may suggest joy or peace. Specifically, however, the patterns resulting from resemblances between vowel and consonant sounds are based upon traditional or conventional interpretations.

The repetition of the same sounds in the first syllables, or first accented syllables, of words is called alliteration:

Looking and loving our behaviors pass
The stones, the steels and the polished glass,

The repetition of the same vowel sounds with different consonants is called assonance:

And all the summer through the water saunter.

Here the *n*-sound in “saunter” prevents the two words from rhyming perfectly, which would spoil the effect. The repetition of consonantal sounds when the vowel sounds differ is called consonance:

And feed deep, deep upon her peerless eyes.

The use of sounds which supposedly echo or suggest the meaning is called onomatopoeia:

The moan of doves in immemorial elms.

Finally, rhyme, which was discussed as part of the theoretical pattern of English verse, is of extreme importance in contributing to the sound quality of poetry.

OTHER SYSTEMS OF VERSIFICATION

Other systems of versification include the quantitative, syllabic, and accentual.

Quantitative Versification. The versification of classical Greek and Latin poetry is said to be quantitative, because its main principle of patterning is the length of time taken to utter syllables, in contradistinction to the degrees of energy with which they are uttered, as in English. In the typical foot of a dactylic hexameter, for example (see Latin example in accompanying table), the first syllable is thought of as longer than the other two and not as being accented more strongly than the others. End rhyme was not used in such verse. Classical Greek and Latin poetry contains a profusion of other quantitative patterns that are sometimes very complex.

Syllabic Versification. The Romance languages (q.v.), such as French, Italian, Spanish, and Portuguese, make use of another system of versification that developed probably in part from Late Latin or Vulgar Latin models; see LATIN LANGUAGE. This system is called syllabic, because within the line the number of syllables, and not their accent or length, is the most important factor. In French poetry the most used line is the Alexandrine (q.v.), which contains twelve syllables with a caesura after the sixth syllable. Although the line is not constructed on a pattern of accents, two basic stresses are felt. These stresses fall on the final syllable of the line and on the syllable preceding the caesura (see accompanying table). End rhyme is a frequent feature of Romance verse. In all probability the features of syllable counting and rhyme in English verse are a heritage from French and Italian verse.

Accentual Versification. The verse of the ancient Germanic peoples, including Old English verse, was accentual; see ENGLISH LITERATURE: Old

PRINCIPAL SYSTEMS OF VERSIFICATION

Accentual-Syllabic

Iambic pentameter.
Iambic trimeter.
Trochaic tetrameter.
Anapestic dimeter.
Dactylic hexameter: last foot trochaic.

Quantitative

Latin quantitative verse: dactylic hexameter, with spondaic fourth and sixth feet.

Accentual

Old English accentual verse: four stresses, alliteration on first, second, and third. Caesura indicated by double bar.

Syllabic

French syllabic verse: Alexandrine with caesura after sixth syllable and basic stresses on sixth and twelfth syllables.

But tair/ries yēt / the Cause / for which / Hē died.
Let all / the rest / be thine.
Thus the / Birch Can/oe was / buil'ded.
With their skits / on the time.
This is the / forest prim/eval. The/murmuring / pines
and the / hemlocks.

Tu rēger / e imperi / o populi / os, Ro/mane,
me/mento.

Fōlc othe frēoburh, // thaer he afēded wāes.

Que le bruit des rameurs // qui frappaient en
cadence.

English or Anglo-Saxon Period. Four stress accents are distributed through each line of Old English verse, but the number of unaccented syllables to the line is not fixed, so that any number of unaccented syllables, or none, may intervene between stresses (see accompanying table). Furthermore, alliteration in two or three of the four stresses per line, another invariable feature of this verse, served as a guide to the accent and also as an embellishment.

Accentual verse remained popular in English as late as the 15th century. It exhibits end rhyme only in the later phases of its history, when its rules had become considerably relaxed. Stress accent remained as a feature of later English versification, but alliteration remained usually only as an occasional, nonstructural feature. When, on the French and Italian model, the total number of syllables, or feet, to the line became significant in English verse, the present accentual-syllabic system was established and the accentual system dropped out of use, except for occasional experimentation.

See also POETRY; RHYTHM.

A.K.H.

VERTEBRATES, chordate animals possessing segmented spinal columns in the adult stage. In many widely accepted systems of classification, these animals are grouped into the subphylum Vertebrata, a division only slightly less comprehensive than the phylum Chordata (q.v.). The subphylum includes: mammals (including man), birds, reptiles, amphibians, fish, rays, and lampreys.

The vertebrate body is typically elongated and exhibits bilateral symmetry. Two pairs of appendages are usually present, but these may be greatly modified to adapt the animals to a highly specialized habitat, for example, wings of birds for flying and fins of fish for swimming; or these appendages may be altogether undeveloped, as

in the lampreys. The central nervous system, made up of a spinal cord that is enlarged and highly differentiated anteriorly to form a brain, is a tube which lies dorsal to the notochord or vertebral column, and parallel to the long axis of the body. In the head of most vertebrates, the brain is enclosed within a bony skull called the cranium. The head, at the anterior end of the body, also contains the main sensory organs of sight, sound, and smell, which have direct connections to the brain, and the mouth.

At some stage in the development of vertebrate animals, the notochord, a supporting rod, develops along the median dorsal axis of the body; in most vertebrates this notochord is later replaced by a segmented spinal column, consisting of a series of small bones with articulating surfaces. The spinal column, or backbone, provides great flexibility to the body. The development of vertebrates is accompanied by the formation of a series of slits, or gill clefts, in the walls of the pharynx. In aquatic forms these gill clefts become associated with highly vascular filamentous gills, which function together throughout life as organs of respiration. Terrestrial and amphibious vertebrates breathe by means of lungs; the gill slits function as breathing apparatus in those animals having a larval stage in their development, but are vestigial in all the adult animals. The urinogenital system and the excretory end of the digestive tract have ventral openings near the posterior end of the body. The heart and main circulatory vessels are located dorsal to the digestive tract. The trunk of the body contains a body cavity, or coelom, lined with peritoneum into which most of the visceral organs are suspended by means of mesenteries. The muscular system is composed of segmented blocks of muscle tissues, and is characterized by bilateral symmetry. This seg-

VERTIGO

mentation and symmetry is repeated in the nervous, circulatory, and urinogenital systems, as well as in the skeletal framework of the body. All vertebrate reproduction (q.v.) is sexual and the sexes are almost always separate. Protective structures, such as scales, feathers, and hair, are usually formed as outgrowths from the skin.

The vertebrate animals have a long evolutionary history; earliest well-differentiated vertebrate fossils occur in the rock strata laid down during the Ordovician Period of the Paleozoic Era; see EVOLUTION; PALEONTOLOGY.

See also separate articles on most of the animals and anatomical parts, organs, and systems mentioned above. I.T.S. & K.A.C.

VERTIGO, sensation of personally spinning around or of seeing nearby objects revolve, usually coupled with a sensation of being moved by some outside force. It tends to be accompanied also by nausea, vomiting, headache, or sweating. Usually it is intermittent and of short duration; occasionally it is chronic. Vertigo differs from a sensation of light-headedness, a swimming sensation, or a sense of falling. These are examples of false vertigo that can be self-induced by rapid self-rotation, for instance, while dancing. Diseases of the cerebral cortex, eye muscles, or cerebellum can cause true vertigo, but such diseases are rare.

Inflammation, infection, or other diseases of the semicircular canals of the inner ear, such as labyrinthitis, inflammation of the labyrinth, are more common causes of true vertigo and are frequently accompanied by auditory sensations such as deafness and ringing in the ear (aural vertigo) and by rapid eye movements (nystagmus); see EAR: *Structure*. These diseases generally last only a few weeks, during which the vertigo is usually brief and intermittent. D.S.T.

VERWOERD, Hendrik. See SOUTH AFRICA: *History*.

VERY HIGH FREQUENCY, usually abbreviated VHF, radio-signal frequency ranging from 30 megahertz (MHz) to 300 MHz; see FREQUENCY; RADIO; WAVE MOTION. This frequency is used for FM and amateur radio broadcasting and for television transmission; see FREQUENCY MODULATION; TELEVISION: *Television Transmission*.

VESALIUS, Andreas (1514–64), Belgian anatomist and physician whose dissections of the human body and description of his findings helped to correct misconceptions prevailing since ancient times and lay the foundations of the modern science of anatomy.

Vesalius was born in Brussels about Dec. 31, 1514. The son of a celebrated apothecary, he at-

tended the University of Louvain and later the University of Paris, where he studied medicine (1533–36), showing a special interest in anatomy. Further study at the University of Padua brought him not only his medical degree (1537) but an appointment as a lecturer on surgery. His continuing research revealed that the anatomical teachings from antiquity of the Greco-Roman physician Galen (q.v.), then revered in the medical schools, were based on dissections of animals, even though they were intended to provide a reliable guide to the structure of the human body. Using the knowledge acquired in his own dissections of human cadavers, he wrote an elaborate anatomical work, *De Humani Corporis Fabrica* ("On the Structure of the Human Body", 7 vol., 1543), published in Basel, Switzerland, with fine engravings by Jan van Calcar. The first anatomical textbook that could pretend to scientific accuracy, it aroused heated dispute in the medical profession; it also helped lead to his appointment as physician in the imperial household of Charles V, Holy Roman Emperor. After Charles abdicated, his son, Philip II, appointed Vesalius one of his physicians in 1559. The Belgian resided at the imperial court in Madrid for several years, then obtained leave to make a pilgrimage to the Holy Land. On the voyage home in 1564, he died on the island of Zacynthus.

VESPASIAN, in full TITUS FLAVIUS SABINUS VESPASIANUS (9–79 A.D.), Roman Emperor (69–79 A.D.), born in Sabine Reate, near Rome. During the middle of the 1st century A.D., he commanded a legion in Germany, and in Britain conquered the Isle of Wight. In 66 A.D. he campaigned against the Jews in Judaea; see PALESTINE: *History: Roman Conquest*. Upon being chosen emperor in 69 A.D., he left the war in Judaea to his son, later the emperor Titus (q.v.), and returned to Rome where he restored the government and the public finances. After the capture and destruction of Jerusalem by Titus in 70 A.D., the world was at peace for nine years. Other important events of Vespasian's reign include the suppression of a formidable revolt (69–70) by the Germanic Batavians under their leader Julius Civilis (fl. 1st century A.D.); conquests in Britain by the Roman general Gnaeus Julius Agricola (q.v.); the development of a more extensive educational system; and the construction of the Colosseum (see AMPHITHEATER) in Rome. See also ROME, HISTORY OF: *The Empire: The Flavians and the Antonines*.

VESPERS. See BREVIARY.

VESPUCCI, Amerigo (Lat. *Americus Vesputius*) (1454–1512), Italian navigator, born in Flor-

ence. In 1495 he took over the business of a merchant in Seville who had furnished supplies to the vessels voyaging to the West Indies. He later set out for the New World himself. He left accounts and maps of four voyages, claiming that on the first (1497-98) he reached the North American mainland before any other explorer. Although most scholars discredit many of his claims and seriously doubt whether there was a first voyage, they tend to agree that Vespucci did, on the expedition led by the Spanish soldier Alonso de Ojeda (1465?-1515) in 1499-1500, explore a large section of the northern coast of South America, and, on a subsequent voyage, may have explored also part of that continent's eastern coast. The German geographer and cartographer Martin Waldseemüller (q.v.), who translated Vespucci's narrative in 1507, suggested that it might be proper to name the new continent America, an adaptation of the explorer's given name of Amerigo. Applied first to the southern continent, the name came gradually into use as that of the two western continents after it appeared on a planisphere published by Waldseemüller in 1516.

VESTA, in Roman mythology, the goddess of the hearth worshipped by Roman families as a household deity. The most important public shrine to Vesta was her round temple in the forum at Rome, where her fire was said to have been brought from Troy by Aeneas (q.v.), the legendary founder of Rome. The shrine was symbolic of the safety of the city and was watched continually by six vestal virgins (q.v.), priestesses who kept the fire burning and who served for terms of thirty years according to severe rules. In early June of each year a festival honoring Vesta, called Vestalia, was held. In form the goddess was associated with the flames of her fire. Her Greek counterpart was Hestia (q.v.). See also LARES; PENATES; ROMAN RELIGION AND MYTHOLOGY.

VESTAL VIRGINS, in Roman antiquity, priestesses of Vesta, goddess of the hearth. Originally there were two and then four vestals selected by the king; later the number was increased to six and they were selected by the Pontifex Maximus, the high priest in the Roman religion. The vestals were vowed to thirty years of service as virgins, ten of learning, ten of performance, and ten of teaching. A vestal who broke her vow of chastity was buried alive. To be eligible a girl had to be over six and under ten years of age and without physical or mental defects; she had to be the daughter of a freeborn citizen resident in Italy; and both her mother and father had to be living. Among the duties of the vestals was

the guarding and annual renewing of the sacred fire at the public shrine to Vesta and preparation of the sacrifices. They enjoyed many privileges, including the right to wear bridal dress.

VESTERÅLEN. See LOFOTEN.

VESTMENTS, ECCLESIASTICAL, dress worn by ministers of religion, specifically those of the Christian churches, for their official acts.

Vestments in the Roman Catholic Church.

The laws governing the use of vestments by the Roman Catholic clergy are set forth in the *rubricae generales*, the precepts for guidance of the priest (q.v.) in carrying out the sacred rites found principally in the missal (q.v.), the prayer book for the Mass (q.v.). In general, Roman Catholic ecclesiastical vestments may be divided into three classes: (1) *sacrificial vestments*, or those worn by the various celebrants of the Mass; (2) *episcopal vestments*, or those worn by bishops and other members of the higher clergy; and (3) *general vestments*.

SACRIFICIAL VESTMENTS. The chasuble, a long, sleeveless, mantlelike garment is the principal outer vestment worn by the priest at the Mass. Draped around the priest's neck under the chasuble is a narrow embroidered band called the stole. Both the chasuble and the stole are colored, either white, red, green, violet, or black, depending upon the season of the church calendar (q.v.) or the feast or occasion being commemorated. The chasuble may also be decorated with various liturgical symbols or ornamental designs. The stole is decorated with one cross at each end and a third cross so placed as to lie on the back of the neck. Draped over the left wrist of the celebrant, and also of any participating deacons or subdeacons, is a short strip of material called the maniple; the maniple has been made optional since Vatican Council II (see VATICAN COUNCILS). The alb, a close-fitting garment of white linen, is worn under the stole and the chasuble; the lower part of this vestment may be made of lace. The alb reaches to the feet and is confined about the waist by a linen sash, or cincture. The amice, a strip of fine white linen, oblong in shape, is worn by the priest on his shoulders under the alb. Special outer vestments worn by the deacon and subdeacon are the dalmatic and tunicle, close-fitting garments of the same material and color as the chasuble worn by the celebrant; the dalmatic and tunicle have sleeves and reach to the knees.

EPISCOPAL VESTMENTS. The full vestments of a bishop when at the altar include, over a long purple or black cassock (see *General Vestments*, below), the amice, alb, cincture, stole, maniple,



*Cope of embroidered
brocade made in Persia
in the early 17th century.
Metropolitan Museum of Art-The
Rogers Fund*

and chasuble; the dalmatic and tunicle may also be worn. On his head he wears the miter, a high, tongue-shaped cap, terminating in a two-fold point. In his hand he carries the pastoral staff or crozier. Resembling a shepherd's crook, the crozier is presented to the bishop at his consecration as a symbol of the authority he is to exercise over his flock. Around the bishop's neck is worn the pallium, a circular band of white wool, generally richly embroidered and marked with several crosses.

Among less formal episcopal vestments, the rochet is a close-fitting vestment of linen, somewhat like a shorter alb or surplice with tight sleeves. It may be worn only by bishops and abbots, although it is sometimes worn by canons as a special privilege. The mozzetta is a short cape covering the shoulders, a part of the state dress of the bishop when not officiating; it is worn over the rochet. The mantelletta, a knee-length sleeveless garment of silk or wool, is worn to cover the rochet by cardinals, bishops, and other prelates. The cappa magna is the full-length overgarment prescribed for episcopal use; it has a train and an attached shoulder cape.

GENERAL VESTMENTS. The most important general vestment is the cope, a wide cloak of silk or other material reaching nearly to the feet; the cope is fastened in front by a clasp called the morse and has a semicircular hood at the back. The humeral veil, an oblong scarf, is used with the cope during special ceremonies; it is worn around the shoulders and the front ends are draped over the paten, pyx, or monstrance held

in the priest's hands. The surplice is a garment of linen worn by all clerics and assistants in choir and priests administering the sacraments.

Under all the other vestments is worn the cassock. A close-fitting garment reaching to the feet, it is the distinctive dress of clerics, in church and out. The color varies, being black for a priest, purple for a bishop, and red for a cardinal; the pope alone wears a white cassock. The biretta, which is also a part of the priest's street or house dress, is a square cap with three ridges (four in the case of doctors of divinity) extending outward from the center of the top. The zucchetto is a small, round skullcap, of color suited to the wearer's rank, which, if worn in church, is removed only at the most solemn parts of the services.

Vestments of the Greek Orthodox Church.

A bishop of the Greek Orthodox Church, when attired for Divine Liturgy (corresponding to the Mass of the Roman Catholic Church), wears a cassock over which is the sticharion, a vestment equivalent to the alb of the Roman Catholic Church, and the epitachelion, a long narrow stole. A zone, or girdle, holds together these two vestments. In addition, a bishop wears the sakos, a tight-fitting garment that symbolizes the seamless robe of Christ; the omophorion, which corresponds to the Roman Catholic pallium; the epigonation, a diamond-shaped ornament, usually of brocade, suspended by a ribbon from the right side of the girdle or hanging from the sakos; and the epimanikia, richly embroidered cuffs worn over the sleeves of the sticharion.

The bishop also wears a miter and a pectoral cross and carries a crozier.

At Divine Liturgy the priest wears the epitachelion, sticharion, zone, epimanikia, and the phelonion, a vestment that resembles the Roman Catholic chasuble. The deacon wears the sticharion and the epimanikia, and over his left shoulder the orarion, which corresponds to the Roman Catholic stole.

The vestments of the Greek Orthodox Church are generally white or red and are heavily embroidered in gold. Different colors are not used, as in the Roman Catholic Church, to mark special occasions.

Vestments in the Anglican Church. From the time of its establishment in the reign of Henry VIII (q.v.), King of England, the Anglican Church (see CHURCH OF ENGLAND) has been divided into two schools with regard to the use of vestments. In general, the ministers of the High Church

group tend to employ many of the vestments of the Roman Catholic Church. The ministers of the Low Church group tend to use fewer of the Roman vestments. In general, the cassock and surplice are the vestments most in use by the Anglican clergy. The stole is worn also at certain ceremonies. Dignitaries, including chaplains, cathedral canons, and bishops, wear for choir offices the broad black scarf under a hood. The cope is used at the altar in English cathedrals; it is also worn by bishops at great state occasions, such as the coronation of a sovereign. The usual dress for an Anglican bishop in ordinary ministrations consists of a rochet with a black or scarlet chimere, a loose robe with balloon sleeves made of lawn.

Vestments in Some Protestant Church Bodies.

The tendency among the various groups that broke away from the Western Church during the Reformation (q.v.) was to abandon both its

Roman Catholic bishops in choir and mass robes (from a 17th-century engraving). Bettmann Archive



VESTRIS

ceremonies and its vestments. The German reformer Martin Luther (q.v.), however, did not consider the question of vestments important, and the Lutheran Church has retained many of the Roman vestments. The chasuble, for example, although not worn in the German Evangelical (or Lutheran) Church today, is still retained in the Lutheran Church in Sweden and Denmark, along with the cope and pectoral cross. The Calvinists abolished the use of Roman vestments entirely and adopted the *robe de Calvin* or Geneva gown, a loose, black gown with large sleeves. This vestment is today used by ministers of many Protestant denominations.

See also PRAYER, JEWISH: *Dress*.

VESTRIS, name of a celebrated family of French ballet dancers.

Gaétan Vestris (1729–1808), known as “the god of the dance”, reputedly one of the greatest dancers of all time and an outstanding mime. Born in Florence, Italy, on April 18, 1729, into a theatrical family, he was brought to Paris in 1747 and studied at the Royal Academy under Louis Dupré. In 1749 he made his debut at the Opéra, where for some thirty years he was a principal dancer; he also served as ballet master and composer. He died on Sept. 23, 1808, in Paris.

Auguste Vestris (1760–1842), son of Gaétan (by his mistress, Marie Allard, a prominent ballerina), a celebrated dancer who inherited his father’s sobriquet, “the god of the dance”. Born March 27, 1760, in Paris, Auguste made his debut at the Opéra at twelve and continued as a principal dancer there for many years. He died in Paris on Dec. 5, 1842. His son, Auguste-Armand (1788–1825), whom he trained, was a ballet master in London and Vienna.

Lucia Elizabeth Vestris (1797–1856), born Lucia Elizabeth Bartolozzi, wife of Auguste-Armand (who deserted her), an English actress and opera singer. Born in London on Jan. 3, 1797, she scored an early success and became quite wealthy. Leasing a London theater, she staged productions distinguished by their superior sets, costuming, and stage machinery. She died on Aug. 8, 1856, in London.

VESUVIUS, volcano (q.v.) of Italy, near the E. shore of the Bay of Naples, about 10 miles S.E. of Naples. It is the only active volcano on the European mainland. A solitary mountain rising from the plain of Campania, it has a base about 30 mi. in circumference, and is surmounted by two summits, of which the higher is the cone known as Vesuvius proper. On Aug. 24, 79 A.D., a great eruption of Vesuvius began, the top of the mountain was blown off by an explosion, and the cities of Herculaneum, Pompeii (qq.v.), and

Stabiae were overwhelmed by a rain of ashes, lapilli, and mud. No lava was ejected in this eruption, nor in any subsequent eruption until 1066. An eruption in 1631 destroyed five towns and caused the deaths of 18,000 persons. In 1794 a violent outbreak destroyed the town of Torre del Greco. Following numerous smaller outbreaks, a violent eruption took place in April, 1906, lasting ten days and causing great destruction of property and the loss of 2000 lives. Since then smaller outbreaks have occurred in 1913, 1926, 1929, and 1944.

The present height of Vesuvius is 4190 ft., while that of Monte Somma, the lesser summit, is 3714 ft. A funicular railroad has been built from the base of the cinder cone to the summit near the edge of the crater, while an observatory is maintained near the crater.

VETCH, common name applied to herbs of the genus *Vicia*, in the Legume family (Leguminosae). The genus, which contains more than one hundred species, is native to temperate regions and is widely cultivated for food, fodder, and green manure, and as a cover crop. Most species are trailing or climbing plants, with tendrils at the tip of the compound leaves. Common, or spring, vetch, *V. sativa*, also called tare, is native to Europe and bears purple and rose-colored flowers, which grow in pairs or singly at the junction of stem and leafstalk. The seedpod resembles that of the pea. Grown as forage, it has become naturalized in eastern United



Hairy vetch, *Vicia villosa*

States. Other important species, native to Eurasia, include the hairy vetch, *V. villosa*, planted for fodder in dry, open soils; the bitter vetch, *V. ervilia*, used as a winter green-manure crop in California; the broad bean, *V. faba*, is grown for food and forage. The American vetch, *V. americana*, grows in moist soils of northern U.S. and bears clusters of violet flowers.

VETERANS ADMINISTRATION, known also as the V.A., independent agency of the United States government, established by Congressional enactment in July, 1930. The V.A., as the administration is popularly called, is headed by the administrator of veterans affairs, appointed by the President with the approval of the Senate. The central office of the V.A., located in Washington, D.C., is divided into the departments of medicine and surgery, veterans benefits, and data management. The central office comprises also several staff offices, including those of the assistant administrators for administration, appraisal and security, construction, and personnel; the chief data-management director; the chairman of the board of veterans appeals; the director of the information service; the general counsel; and the controller. The V.A. maintains area and regional offices, hospitals, outpatient clinics, domiciliaries, and other so-called field stations.

Benefits for Veterans. The V.A. is authorized to administer Federal laws relating to benefits established by Congress for veterans of the armed forces and for the dependents and beneficiaries of deceased veterans. The Servicemen's Readjustment Act of 1944, popularly called the G.I. Bill of Rights, provided unemployment and education allowances and V.A.-guaranteed home, farm, and business loans for millions of veterans of World War II. Some of the most important benefits administered by the V.A. include an education and training program for veterans with service after Jan. 31, 1955; vocational rehabilitation and education for disabled veterans; and disability compensation and pensions. The administration also guarantees loans for buying or building homes, farms, and business property; provides national service and U.S. government life-insurance benefits; and aids the families of deceased veterans. In addition the administration extends such medical benefits as physical examinations, hospital and outpatient treatment, and domiciliary care.

Assistance Services. As well as providing benefits, the V.A. administers that section of the Soldiers' and Sailors' Civil Relief Act relating to private insurance policies held by persons on active duty in the armed forces. It also adminis-

ters, in cooperation with other Federal and State agencies, U.S. veterans assistance centers, expressly established to assist Vietnam War veterans in making the transition back to civilian life.

Under the training program established for veterans with service after Jan. 31, 1955, a veteran is entitled to one month of training for each month spent in service. The maximum is thirty-six months of training. The veteran receives an educational and training allowance from the V.A. to help him meet his expenses. Payments range from \$130 per month for a veteran with no dependents who is enrolled for a full-time schedule of classes in a school or college to \$175 per month for a veteran enrolled full time who has two dependents. A veteran with more than two dependents receives an additional \$10 monthly for each additional dependent. Veterans in training less than full time, and those in on-the-job and on-the-farm training, receive lower payments.

About 2,400,000 Korean War veterans, and slightly more than 2,500,000 veterans with service after Jan. 31, 1955, received some form of training under this program. More than half went to college. The training program for veterans of the Korean War ended on Jan. 31, 1965.

Vocational rehabilitation is provided for war veterans under Public Law 894, as amended. While in training and for two months afterward, disabled trainees get a subsistence allowance ranging from \$110 to \$175 a month, depending on the type of training and on the number of his dependents. These payments are in addition to the usual monthly disability compensation. By February, 1969, more than 728,000 disabled World War II, Korean War, and post-Korean War veterans had taken training to help them overcome the handicaps of their disabilities.

Disability Compensation. Veterans with service-connected disabilities incurred during either wartime or peacetime service may qualify for monthly compensation payments. Pensions may be paid also to veterans of wartime service for total and permanent disabilities not related to their military service, provided their annual incomes do not exceed statutory limitations. Pension rates range from \$29 to \$230 per month.

Loans and Insurance. Loans to veterans for the purpose of buying, building, or improving a home or buying a farm, farmland, or farm equipment may be guaranteed or insured by the V.A. By July, 1971, 8,092,704 qualified veterans had obtained loans totaling more than \$85,300,000,000 (95 percent of them for homes).

In July, 1971, 185,886 World War I veterans had military-service insurance policies valued at

VETERANS DAY

\$798,457,000, about 5,269,130 World War II and Korean veterans held military-service insurance policies valued at \$36,434,037,000.

Pensions and Benefits for Widows and Children. The Veterans Pension and Readjustment Assistance Act of 1967, which became effective Aug. 31, 1967, generally increased benefits for widows and children of deceased servicemen and of veterans who died of service-connected causes. The act made veterans of the Vietnam War eligible for wartime benefits and also partially related payments to the military pay of the deceased.

Children are eligible for war orphans' education if one of their parents was a World War I, World War II, Korean War, or Vietnam War veteran who died or was permanently disabled as a result of military service. Eligible students, who must be between eighteen and twenty-six years of age, are entitled to take up to thirty-six months of schooling and to receive a monthly allowance of \$130 if attending school full time. The benefit is for a formal school program and not for on-the-job training.

Hospital Facilities and Medical Services. The V.A. operates 165 hospitals for the treatment of ill and disabled veterans, including those ill or disabled as a result of military service and those suffering illnesses or disabilities not connected with service. In addition a number of beds are available for veterans on a contract basis in other than V.A. hospitals. As well as treating veterans, the V.A. conducts medical research, including research on cancer, mental health, and heart ailments, and the problems of aging.

Statistics. The following table, based on a 1970 census report and released by the Bureau of the Census in April, 1973, shows the numbers of U.S. male veterans by period of service.

Period of Service	1960	1970
Total veterans.....	23,103,249	28,112,495
Vietnam conflict.....	...	4,503,798
Korean conflict.....	4,051,288	4,702,306
Korean conflict and World War II.....	803,287	863,123
World War II.....	13,042,489	12,461,635
World War I.....	2,608,189	1,587,598
Other.....	2,597,996	3,994,035

VETERANS DAY, formerly **ARMISTICE DAY**, holiday observed annually in the United States on the fourth Monday in October in honor of those veterans, living and dead, who served with the U.S. armed forces in time of war. Armistice Day, the forerunner of Veterans Day, was originated to commemorate the termination (11:00 A.M., Nov. 11, 1918) of hostilities in World War I (q.v.). In 1919, on the first anniversary of the truce, U.S. President Woodrow Wilson (q.v.)

issued a proclamation eulogizing the war dead and referring to November 11 as Armistice Day. On Nov. 11, 1921, an American unknown soldier was entombed with special ceremonies in Arlington National Cemetery (q.v.) in Virginia; see **UNKNOWN SOLDIER**. In the late 1920's Armistice Day came to be observed as a legal or public holiday throughout the U.S. and its possessions. The holiday acquired its present name and broader significance under the terms of legislation adopted by Congress in 1954. Since 1971 Veterans Day is observed on the fourth Monday in October; see **HOLIDAY**. In France and Great Britain, November 11 has been observed as Armistice Day since 1920, in honor of Allied soldiers who fell in World War I.

VETERANS OF FOREIGN WARS OF THE UNITED STATES, commonly abbreviated **V.F.W.**, association founded in 1899 and chartered by the United States Congress in 1936. Eligibility requirements include military service on foreign soil or in hostile waters in a campaign for which the U.S. government has authorized a medal. The organization promotes the welfare of its members, supports patriotic activities, and influences veterans' legislation. In 1970 the total membership of the V.F.W. and its women's auxiliary was about 2,104,000. Headquarters are in Kansas City, Mo. The official publication is the *V.F.W. Magazine*. A V.F.W. home for widows and orphans is located in Eaton Rapids, Mich. **VETERINARY MEDICINE**, branch of medical science that deals with the prevention, cure, or alleviation of diseases and injuries of animals, especially of domesticated animals, and including the biology (anatomy and physiology) as well as the pathology (qq.v.) of animals.

Veterinary medicine is an indispensable guardian of the vast livestock industry and of companion animals of man. It provides specific benefits to human health by (1) removal of sources of exposure or infection to man through eradication or control of those animal diseases transmissible to man; (2) development of animal disease preventives or treatments that can be adapted for use in human beings; and (3) food hygiene programs that protect the consumer against food-borne diseases; see **FOOD PRESERVATION**; **PACKING INDUSTRY**. In the United States, the work of veterinarians on diseases related to animal breeding and reproduction has great economic significance, both to the individual livestock owner and to the nation. Losses caused by animal diseases will affect the ability of the nation to feed the rapidly expanding population. Eradication programs for diseases of animals, such as undulant fever and tuberculosis (qq.v.),

to which man is also susceptible, have decreased the incidence of these diseases in the human population. Bovine tuberculosis, for example, is now extremely rare in humans.

Today there are eighteen schools and colleges of veterinary medicine in the U.S. and three in Canada. Most of them are outgrowths of departments of veterinary science in land-grant colleges (q.v.); the University of Pennsylvania and Tuskegee Institute (Tuskegee, Ala.), however, are private institutions. The Iowa State University College of Veterinary Medicine, founded in 1879, is the oldest school still in operation. The U.S. and Canadian veterinary schools have a total annual enrollment of about 530 students.

Modern veterinary medicine has been placed upon the same basis as human medicine, and similar methods of investigation are employed. The veterinary investigator has found a most fruitful field in the pathology of organic, constitutional, functional, and infectious diseases of animals, as well as in bacteriology, methods of vaccination and immunization, and animal hygiene and methods of disinfection. Systematic investigations have been made in veterinary pharmacology and toxicology, including mineral and plant poisons. The field now includes meat and milk inspection, establishment of quarantine, regulation of traffic in livestock, and eradication of animal plagues. Research in veterinary medicine includes observation of the effects of high altitudes on experimental animals sent aloft in rockets and satellites; see **ASTRONAUTICS**.

In 1970 there were approximately 25,000 veterinarians in the U.S.; most of these, about 19,150, were engaged in animal practice. Others specialized in such fields as teaching and research, public health, meat inspection, and military veterinary medicine.

See **ANIMAL HUSBANDRY**; **DISEASES OF ANIMALS**; **MEDICINE: 19th-century Medicine**. R.R.St.

VETO (Lat., "I forbid"), in parliamentary government, the executive power, as that of the President of the United States, to abrogate or kill a measure that has already been passed by a legislative body.

In the U.S., according to Article 1, Section 7 of the Constitution of the United States (q.v.), the President has only limited veto authority since his negation of a legislative act can be overridden by a two-thirds majority in both houses of Congress. A Presidential veto, unlike that in many States, is comprehensive, applying to all parts of a bill, and the President must communicate to Congress his reasons for a veto. In the case of a so-called pocket veto, sometimes used for political reasons, a bill fails to become law

when the President does not sign it and the Congress happens to adjourn within a ten-day period after its submission to the chief executive. On the other hand, if Congress remains in session and does not receive the unsigned bill from the President within that time, the measure becomes law. The great majority of Presidential vetoes throughout American history have not been overridden. Of the some 600 vetoes handed down by President Franklin Delano Roosevelt (q.v.) in the 1930's and 1940's, only nine were voted against by Congress.

The governors of most States in the U.S. have veto powers, which in some cases can be overruled by a simple majority rather than two thirds of their legislatures. The monarch of Great Britain has long had putative absolute veto power, but this prerogative has not been exercised since 1708; see **GREAT BRITAIN: Government: Legislature**.

See also **CONGRESS OF THE UNITED STATES**; **LEGISLATURE**; **PRESIDENT OF THE UNITED STATES**.

VIADUCT. See **BRIDGE**.

VIATICUM (Lat., "provision for a journey"), in Christianity, the Lord's Supper (q.v.) administered to persons in danger of death. It may be received frequently during the same sickness without a period of fasting (q.v.).

VIAUD, Louis Marie Julien, real name of French novelist and naval officer Pierre Loti (q.v.).

VIBORG. See **VYBORG**.

VIBRAPHONE, musical instrument of the percussion group, similar to the xylophone (q.v.). When the tuned metal bars are struck, with a hammer that has a head of wound yarn, the notes resonate in tubular chambers beneath each bar. In between the bars and resonance chambers, metal disks revolve on a motorized drive shaft. The air deflected by the spinning disks imparts a slight tremolo to the notes as they echo in the resonance chambers. See **MUSICAL INSTRUMENTS: Percussion Instruments**.

VIBRATION, or **OSCILLATION**, in physics, chemistry, and engineering, rapid and repeated motion back and forth past a central neutral position, or position of equilibrium. A single motion from one extreme position to the other and back, passing through the neutral position twice, is called a cycle, and the number of cycles per second, or hertz (Hz), is known as the frequency of the vibration. The vibrations that are of importance in engineering generally have frequencies of from 200 to several hundred hertz; the vibrations important in physics and chemistry have frequencies of billions of hertz.

A vibrating object possesses so-called energy

VIBRATION

of vibration; this energy is alternately in the form of kinetic energy, or energy of motion, and potential energy, or energy of position; see ENERGY. In the case of the pendulum (q.v.), the potential energy at the extreme positions is the result of the gravitational force on the body; see GRAVITATION. In the case of a vibrating string, as on a violin (q.v.), the potential energy is the result of the elasticity of the stretched string.

A swinging pendulum or a plucked violin string eventually comes to rest if no further forces are impressed on them. The force which causes them to stop vibrating is called damping. In these examples the damping forces are frictional, but other damping forces, such as electrical or magnetic forces, may enter into a vibrational system; see ELECTRICITY; ELECTRONICS; MAGNETISM.

Natural Frequency. Any vibrating object has a so-called natural frequency. The natural frequency, for example, of a pendulum 39 in. long is $\frac{1}{2}$ Hz. One of the essentials of a vibration system is an impressed force causing the vibration. If swinging is initiated in a 39-in. pendulum, it swings back and forth once every 2 sec. If the pendulum is struck lightly once every 2 sec., the swing increases gradually until the amplitude of vibration is very large. In general, vibrations of large amplitude can be caused only by a large impressed force, or by a small force, or by a small force impressed repeatedly with the same frequency as the natural frequency. Most of the serious vibration problems in engineering are due to the latter cause. Such problems can often be solved by changing or isolating one of the two frequencies. If, for example, the natural frequency of the body of an automobile is the same as the frequency of explosions in the engine when the car is traveling at 40 m.p.h., the body may begin to vibrate or shake roughly. Such vibration can be avoided by mounting the engine on rubber to isolate the body from the engine.

Flutter. A dangerous type of vibration is the sudden, violent oscillating motion known as flutter. This occurs most frequently in the control surfaces of aircraft, but is more commonly seen in the so-called galloping of sleet-covered electrical transmission wires in high winds. One of the most spectacular instances of flutter was the failure in 1940 of the Tacoma Narrows Bridge in Tacoma, Wash., as the result of a 42-m.p.h. gale.

Flutter, an unstable, high-frequency oscillation, is caused by the combination of aerodynamic forces with those stemming from the bending and twisting characteristics of the

structure; see AERODYNAMICS. The amplitude of the vibration increases so rapidly that a structure subjected to flutter disintegrates almost instantaneously. Prevention of flutter is therefore an important consideration in the design of bridges and aircraft. The so-called flutter analysis for aircraft is usually supplemented by tests on model airplanes carried out in a wind tunnel (q.v.). See HARMONICS; OSCILLOGRAPH; OSCILLOSCOPE; SOUND; WAVE MOTION.

VIBURNUM, genus of plants in the Honey-suckle family (Caprifoliaceae), having a five-toothed calyx, a five-lobed, wheel-shaped, bell-shaped, or tubular corolla, five stamens, three sessile stigmas, and a one-seeded berry. The various species are shrubs with simple opposite leaves, natives chiefly of the northern parts of the world. The species *V. lantana*, sometimes



Viburnum, *Viburnum tinus*

called the wayfaring tree, is a native of warmer temperate parts of Europe and Asia. Another European species, *V. tinus*, known as the laurustine, is widely cultivated. Two North American species, *V. edule* and *V. trilobum*, allied to the guelder-rose, produce drupes of an agreeable taste, which are used like cranberries.

VICENTE, Gil (1470?-1536?), Portuguese dramatist. Although little is certain about his life, it is assumed that he was born in Lisbon and became court dramatist to the Portuguese kings

VICE - PRESIDENT OF THE UNITED STATES, THE

John II, Emanuel (qq.v.), and John III (see *under* JOHN). Considered by scholars the founder of Portuguese drama, Vicente wrote forty-four plays. Of these, 11 were written in Spanish, 15 in Portuguese, and 18 in a combination of both languages. Vicente wrote comedies, tragicomedies, and farces, all of which are in the medieval tradition, showing no influence of the Renaissance (q.v.). Three short morality plays, *Auto da Barca do Inferno* (1516; Eng. trans., *The Ship of Hell*, 1929), *Auto da Barca do Purgatório* ("The Ship of Purgatory", 1518), and *Auto da Barca da Glória* ("The Ship of Glory", 1519), are considered his best works. See PORTUGUESE LITERATURE: *Outside Influence*.

VICENZA, city and commune in Italy, capital of Vicenza Province, Venetia Region, situated at the junction of the Bacchiglione and Retrone rivers, 42 miles w. of Venice. Vicenza is a commercial center as well as an agricultural market. The chief industries of the city are ironworks, steel mills, and textile factories. The town is noted for its splendid churches, palaces, and other buildings, many of which were designed by the native-born architect Andrea Palladio (q.v.), who made the city famous for his adaptations of Roman architecture to 16th-century practices in Vicenza. Remains of a 13th-century wall that encircled the town are still standing.

Vicenza is thought to have been founded by settlers from Liguria (q.v.). A free commune in the Middle Ages, from 1404 to 1797 it was ruled by Venice, and from 1797 to 1866 by Austria. Pop. of city (1971) 115,882.

VICE-PRESIDENT OF THE UNITED STATES, THE, second officer of the government of the United States. His only duty, according to the Constitution of the United States (q.v.), is to preside over the deliberations of the Senate, except when it is sitting as a court of impeachment for the trial of the President, in which case the chief justice presides; in the Senate the Vice-President has a casting vote only in the event of a tie. The Vice-President also presides at the joint meeting of the two houses of Congress when the electoral votes are counted. The duties of the office were somewhat expanded during the terms of President Dwight David Eisenhower (q.v.). The role has come to include international travels for purposes of goodwill and fact finding, as well as responsibility for special governmental projects and committees. Recent Vice-Presidents have, for example, been members of the National Security Council (q.v.) and the Urban Affairs Council. Thus they have been prepared for the chief potential duty of the office, since the Vice-President is made by

the Constitution the successor of the President in case of the latter's removal from office or of his death, resignation, or inability to discharge the powers and duties of the office. The deaths of Presidents William Henry Harrison in 1841, Zachary Taylor in 1850, Abraham Lincoln in 1865, James A. Garfield in 1881, William McKinley in 1901, Warren G. Harding in 1923, Franklin D. Roosevelt in 1945, and John F. Kennedy

VICE-PRESIDENTS OF THE UNITED STATES

Vice-President	Service	Party	President
John Adams	1789-1797	Federalist	George Washington
Thomas Jefferson	1797-1801	Republican	John Adams
Aaron Burr	1801-1805	Republican	Thomas Jefferson
George Clinton	1805-1809	Republican	Thomas Jefferson
	1809-1812		James Madison
Elbridge Gerry	1813-1814	Republican	James Madison
Daniel D. Tompkins	1817-1825	Republican	James Monroe
John C. Calhoun	1825-1829	Republican	John Quincy Adams
	1829-1832		Andrew Jackson
Martin Van Buren	1833-1837	Democrat	Andrew Jackson
Richard M. Johnson	1837-1841	Democrat	Martin Van Buren
John Tyler	1841	Whig	William Henry Harrison
George M. Dallas	1845-1849	Democrat	James Knox Polk
Millard Fillmore	1849-1850	Whig	Zachary Taylor
William R. King	1853	Democrat	Franklin Pierce
John C. Breckinridge	1857-1861	Democrat	James Buchanan
Hannibal Hamlin	1861-1865	Republican	Abraham Lincoln
Andrew Johnson	1865	Republican	Abraham Lincoln
Schuyler Colfax	1869-1873	Republican	Ulysses Simpson Grant
Henry Wilson	1873-1875	Republican	Ulysses Simpson Grant
William A. Wheeler	1877-1881	Republican	Rutherford Birchard Hayes
Chester A. Arthur	1881	Republican	James Abram Garfield
Thomas A. Hendricks	1885	Democrat	Grover Cleveland
Levi P. Morton	1889-1893	Republican	Benjamin Harrison
Adlai E. Stevenson	1893-1897	Democrat	Grover Cleveland
Garret A. Hobart	1897-1899	Republican	William McKinley
Theodore Roosevelt	1901	Republican	William McKinley
Charles W. Fairbanks	1905-1909	Republican	Theodore Roosevelt
James S. Sherman	1909-1912	Republican	William Howard Taft
Thomas R. Marshall	1913-1921	Democrat	Woodrow Wilson
Calvin Coolidge	1921-1923	Republican	Warren Gamaliel Harding
Charles G. Dawes	1925-1929	Republican	Calvin Coolidge
Charles Curtis	1929-1933	Republican	Herbert Clark Hoover
John N. Garner	1933-1941	Democrat	Franklin Delano Roosevelt
Henry Agard Wallace	1941-1945	Democrat	Franklin Delano Roosevelt
Harry S. Truman	1945	Democrat	Franklin Delano Roosevelt
Alben W. Barkley	1949-1953	Democrat	Harry S. Truman
Richard M. Nixon	1953-1961	Republican	Dwight David Eisenhower
Lyndon B. Johnson	1961-1963	Democrat	John Fitzgerald Kennedy
Hubert H. Humphrey	1965-1969	Democrat	Lyndon Baines Johnson
Spiro T. Agnew	1969-1973	Republican	Richard Milhous Nixon
Gerald R. Ford	1973-1974	Republican	Gerald Rudolph Ford
Nelson A. Rockefeller	1974-1977	Republican	Gerald Rudolph Ford
Walter F. Mondale	1977-	Democrat	Jimmy Carter

VICEROY

(qq.v.) in 1963 caused the succession of the Vice-President, as did the resignation of Richard M. Nixon in 1974.

Election. The qualifications are the same as those that exist for the Presidency (see **PRESIDENT OF THE UNITED STATES, THE**). The annual salary is \$62,500. The Constitution originally provided that the Presidential candidate receiving the second largest number of electoral votes be declared Vice-President; this method of selection was superseded by that prescribed in the Twelfth Amendment, ratified in 1804. The Vice-President is chosen for the same term and in the same manner as the President; if, however, no candidate for the Vice-Presidency receives a majority of the electoral votes, the election is thrown not into the House of Representatives, as with the Presidential office, but into the Senate, which then chooses by a majority vote one of the two leading candidates. The Twenty-Fifth Amendment to the Constitution, ratified in 1967, provides for filling a vacancy in the office of Vice-President: the President nominates a Vice-President, the nomination to be confirmed by a majority vote of both Houses of Congress. This amendment was applied in 1973, when Gerald R. Ford was confirmed as the successor to Spiro T. Agnew, and in 1974, when, Ford having succeeded to the Presidency (see above), Nelson Rockefeller was confirmed as his choice for the Vice-Presidency. See also separate biographies on each Vice-President.

VICEROY, common name applied to a butterfly, *Basilarchia archippus*, native to the Western Hemisphere from southern Canada to southern United States. It is bright orange red in color with a wide black band running along the outer margins of the wings. The band is punctuated with a uniform row of white spots. The viceroy bears a remarkable color resemblance to the monarch butterfly, *Danaus plexippus*. Although the viceroy lacks the acrid secretions of the monarch, which render the latter repugnant in taste and odor, it is avoided carefully by insectivorous animals because of the superficial resemblance. The eggs of the viceroy are laid at the tips of oak, willow, birch, or linden leaves and are spherical in shape. The surface of the egg is covered with bristles and pitted with six-sided cells. The larva, or caterpillar, is cylindrical in shape and divided into a series of segments. The young caterpillar feeds upon the leaf tip on which it was hatched and attaches bits of partially chewed leaf to the leaf midrib by strands of silk. When winter approaches the caterpillar detaches the uneaten portions of the leaf from the midrib, glues the rib of the leaf to the stem

with a stout silk thread, rolls itself up in the detached leaf to form a hibernaculum, or winter quarters, and reattaches the leaf to the rib. The caterpillar pupates, and the adult butterfly (q.v.) emerges in late spring or early summer. **VICHY**, city of France in Allier Department, on the Allier R., 30 mi. s. of Moulins. Its hot mineral springs, frequented since Roman times, have made it one of the most important spas of Europe. Vichy water is exported in large quantities. After the defeat of France by Germany in World War II, Vichy was made the seat of the government under Marshal Henri Philippe Pétain and his aide Pierre Laval (qq.v.). Pop. (1968) 33,898. **VICKSBURG**, city and port in Mississippi, and county seat of Warren Co., at the confluence of the Mississippi and Yazoo rivers, about 30 miles w. of Jackson. The city lies on a bluff rising some 350 ft. above river level. It is the principal river port of the State, a leading market and shipping point for cotton, and an important industrial community. Industrial establishments include cotton gins, oil refineries, and lumber mills.

The educational institutions in Vicksburg include several vocational schools and All Saints' College (Episcopal), a junior college for women established in 1908. Surrounding the city on the n., e., and s. is the famous Vicksburg National Military Park, which contains nearly 1600 memorials, monuments, and markers, and extensive remains of the fortified battle lines of the Union and Confederate armies. North of the park is the Vicksburg National Cemetery, one of the most beautiful of the national cemeteries. Both the park and the cemetery are administered by the National Park Service (q.v.).

The region of the present city was held successively by the French, British, Spanish, and Americans in the 18th century. Fort Nogales, occupied by United States troops in 1798, was built by the Spanish on the site of Vicksburg in 1791, and the first permanent settlement was established in 1812 by Newitt Vick (d. 1819), a Methodist preacher, for whom the city is named. Vicksburg was incorporated as a town in 1825 and chartered as a city in 1836. Beginning in May, 1862, during the American Civil War, the city was bombarded by Union troops; the Vicksburg campaign, because of the strategic location of the city and its almost impregnable position, was one of the most decisive of Union victories in the war. See **VICKSBURG, CAMPAIGN OF**. Pop. (1960) 29,143; (1970) 25,478.

VICKSBURG, CAMPAIGN OF, major siege of the American Civil War, consisting of military campaigns in 1862-63 and ending with the capture of the city of Vicksburg, Miss., by Union



The siege of Vicksburg (wood engraving from Harper's Pictorial History of the Great War, 1868).

Library of Congress

troops on July 4, 1863. Vicksburg, perched on a steep bluff along the eastern bank of the Mississippi R., was of strategic importance to the North. The capture of Fort Donelson in February, 1862, had broken the Confederate first line of defense for the Mississippi Valley; see FORT DONELSON NATIONAL MILITARY PARK. Vicksburg now remained the one serious obstacle to complete command of the Mississippi R. by Federal forces. Union control of the Mississippi meant the Confederacy would be split in two.

In May, 1862, Union forces made an unsuccessful attempt to take the city by means of a naval expedition. The Confederates strengthened their coastal defenses, setting up extensive batteries to obstruct passage on the river. On June 27 a Union fleet under Admiral David Glasgow Farragut (q.v.) appeared below the city; the next day two frigates and six gunboats attempted to run the Confederate river fortifications. The attack failed, as did several subsequent maneuvers to bypass Vicksburg by sea.

In December, 1862, the Union general Ulysses S. Grant (q.v.) proposed moving from Holly Springs, then a base, against Granada, with a view to cutting the Confederate line of communications and drawing General John Clifford Pemberton (1814–81), the Confederate commander of Vicksburg, from his stronghold. Meanwhile the Union general William Tecumseh Sherman (see *under* SHERMAN), with 35,000 troops, was to be convoyed downriver by a fleet commanded by the Union naval officer David Dixon Porter (qq.v.), and to seize the city in the absence of the major part of the defenders. These plans, however, were upset by a Confederate raid on Holly Springs, which hindered Grant's advance. Sherman, after a successful landing, found the countryside virtually impass-

ble because of swampy land. He had just reached firm ground when Pemberton's return made a further attack useless.

Grant now assumed full command, and made two attempts to dig ship canals that would allow Union ships uninterrupted passage past Vicksburg; both were unsuccessful. Moving his army to the west bank of the Mississippi R. he marched to the town of Bruinsburg, where he recrossed the river on April 30, 1863. Continuing eastward, Grant dispersed a Confederate force near Port Gibson and then was joined by Sherman, who had crossed the river at Grand Gulf. The Confederate general Joseph Eggleston Johnston (q.v.) was advancing to the relief of the beleaguered Vicksburg, but Grant thrust his army between the city and the Confederate force. Grant defeated Johnston at Champion's Hill on May 16 and attacked Vicksburg on May 19. Two assaults on the fortress failed, and regular siege operations were begun; these lasted for six weeks. On July 4 the Confederate defenders capitulated. The total casualties in the campaign were: Union, 10,142; Confederate, 9,091. In addition, the Confederates surrendered 31,000 as prisoners of war.

See CIVIL WAR, THE AMERICAN.

VICTOR, name of three popes and two antipopes.

Saint Victor I (d. 199), pope from 189 to 199. He was probably a native of Africa. His pontificate is remembered mainly for his dispute with the bishops of Asia Minor over their refusal to conform with the practice of the church in Rome as to the date for celebrating Easter (q.v.). His traditional feast day is July 28.

VICTOR

Victor II (1018–57) original name GEBHARD, pope from 1055 to 1057, born of noble parentage in Swabia. Henry III (q.v.), Holy Roman Emperor, appointed him bishop of Eichstätt in 1042, and some years later made him his adviser. In Victor's pontificate of fifteen months he combated clerical marriage (see CELIBACY) and concubinage as well as simony, or the sale of church offices. He remained on amicable terms with Henry III, who continued to repose great trust in him and even gave him several imperial posts. On Henry's death in 1056 Victor secured the imperial throne for the emperor's young son, Henry IV (q.v.), whose guardian he was.

Blessed Victor III, (1027–87), original name DAUFERIUS or DAUFAR, pope in 1086–87. He was born of a Lombardian ducal family in Benevento, Italy, and became a Benedictine monk taking as his religious name Desiderius; see BENEDICTINES. Abbot of Monte Cassino (q.v.) from 1058 to 1086, he became a cardinal in 1059. The period of his incumbency at Monte Cassino was its golden age; he adorned the abbey, reformed its discipline, influenced other Benedictine foundations, and caused some seventy important classical, ecclesiastical, historical, and legal manuscripts to be copied. In 1078 he arranged an alliance between Pope Gregory VII (see *under* GREGORY) and Robert Guiscard (q.v.), the Norman adventurer in Italy, against Emperor Henry IV. Desiderius was elected pope by the Norman interests in 1086, but Antipope Clement III (r. 1080; 1084–1100), aided by imperial troops, compelled him to pass nearly all his pontificate at Monte Cassino. In 1087 an army that Victor sent to Tunis (now Tunisia), Africa, defeated the Saracens (q.v.), an event sometimes considered the beginning of the Crusades (q.v.).

Victor IV (fl. first half 12th cent.), original name GREGORIO CONTI, antipope in 1138. A cardinal, he was elected pope in March, 1138, succeeding Antipope Anacletus II (r. 1130–38) in opposition to Pope Innocent II (r. 1130–43). Influenced, however, by the French ecclesiastic Bernard of Clairvaux (q.v.), he submitted to Innocent two months later.

Victor V or Victor IV (d. 1164), original name OTTAVIANO, antipope from 1159 to 1164. The confusion in numerals arises from Ottaviano's refusal to recognize Gregorio Conti as Victor IV (see above). Ottaviano, who was born in Monticello, Italy, and became a cardinal in 1138, was elected pope in 1159 by supporters of Frederick I (q.v.), Holy Roman Emperor, in opposition to Pope Alexander III (see *under* ALEXANDER), the legitimate pontiff. Most of Western Christendom supported Alexander against Victor, whom the

emperor continued to sponsor until the anti-pope's death.

VICTOR EMMANUEL (It. *Vittorio Emanuele*), name of three Italian rulers and members of the house of Savoy (q.v.), of whom the first was king of Sardinia, the second king of Sardinia and of Italy, and the third king of Italy.

Victor Emmanuel I (1759–1824), King of Sardinia (1802–21), born in Turin, Italy. He was the son of Victor Amadeus III, Duke of Savoy and King of Sardinia (1726–96). Victor Emmanuel commanded Sardinian forces against the French Republican armies from 1792 to 1796, during the wars of the French Revolution (q.v.). He became king of Sardinia in 1802 on the abdication of his brother Charles Emmanuel IV (1751–1819). From 1802 to 1815 the French occupied his family possessions of Piedmont, Nice, and Savoy, but he regained these with the addition of Genoa at the Congress of Vienna in 1815, after the exile of the French emperor Napoleon I (q.v.); see VIENNA, CONGRESS OF. In 1821 Victor Emmanuel abdicated in favor of his brother Charles Felix (1756–1831), during a revolutionary outbreak brought on by his repressive methods of government.

Victor Emmanuel II (1820–78), King of Sardinia (1849–61) and King of Italy (1861–78), born in Turin. He was the son of Charles Albert, King of Sardinia (1798–1849), who abdicated in his favor after being defeated by the Austrians at the Battle of Novara in 1849. Assisted by Italian statesman Conte Camillo Benso di Cavour (q.v.), his premier, Victor Emmanuel developed parliamentary government, reorganized the army, regulated finances, stimulated commerce and industry, and secularized ecclesiastical property. From 1854 to 1856, in order to improve the position of Sardinia in European politics, he assisted Great Britain and France during the Crimean War (q.v.).

Victor Emmanuel strongly supported the movement toward national unity that was growing in Italy at this time. With French aid he repulsed the Austrians when they invaded Piedmont in 1859 and added Lombardy to his realm. The central Italian States accepted him as their king, and after the Italian patriot Giuseppe Garibaldi (q.v.) captured the kingdom of the Two Sicilies from the French in 1860–61, Victor Emmanuel was master of the entire peninsula, with the exception of Venetia which was still held by the Austrians, and the Papal States (q.v.). He was proclaimed king of Italy in 1861. In the same year he ceded Nice and Savoy to France in payment for past and promised French aid. Venetia was won as a result of Italian intervention on



Victor Emmanuel II (painting by the 19th-century Italian artist Gerlando Induno).

Bettmann Archive

the Prussian side in the Seven Weeks' War (q.v.) between Austria and Prussia (qq.v.) in 1866. In 1870 Rome was annexed and made the capital of Italy. Thereafter Victor Emmanuel devoted himself to the peaceful development of Italy.

Victor Emmanuel III (1869–1947), King of Italy (1900–46), and self-styled Emperor of Ethiopia (1936–44) and King of Albania (1939–44), born in Naples. He became king of Italy in 1900 upon the assassination of his father King Humbert I (q.v.). His reign was undistinguished until 1915, when Italy entered World War I (q.v.) on the side of the Allied powers. He spent most of the next three years on active duty at the front in northern Italy. Following the postwar collapse of parliamentary government Victor Emmanuel, to avert civil war, accepted in 1922 the fascist regime of the dictator Benito Mussolini (q.v.). Thereafter his authority was largely nominal.

In 1929, by the provisions of the Lateran

Treaty (q.v.), Vatican City was recognized as completely independent and sovereign. As a result of Mussolini's conquest of Ethiopia in 1935–36 and his seizure of Albania in 1939, Victor Emmanuel acquired new titles. In 1946, after World War II (q.v.), because of Italian anti-fascist and Allied pressure, Victor Emmanuel abdicated in favor of his son, who became Humbert II (1904–). He lived in exile in Portugal and Egypt until his death. *See ITALY: History.*

VICTORIA, city in Texas, and county seat of Victoria Co., at the head of navigation on the Guadalupe R., about 100 miles s.e. of San Antonio. It is linked by a barge canal to the intra-coastal waterway. Oil and natural gas are produced in abundance in the area, and the principal agricultural products are beef cattle, cotton, corn, feed crops, small grains, peanuts, and pecans. In addition to numerous oil-well supply

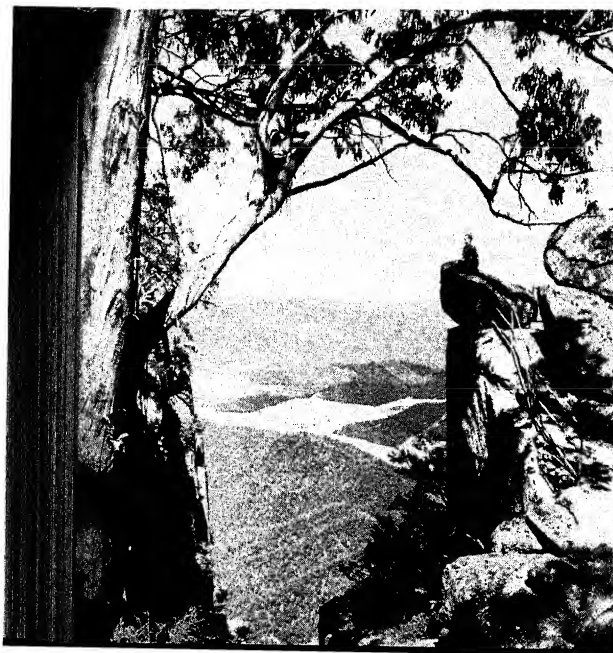
VICTORIA

houses and oil refineries, Victoria contains railroad repair shops, food-processing plants, a machine shop, and sand and gravel plants. Nylon products, aluminum products, building materials, and chemicals are also manufactured. Nearby are the ruins of a Spanish fort and mission, built in 1721. Victoria is the site of Victoria College, a municipal institution established in 1925. The city was founded in 1824 by the Spaniards and incorporated as a city of Texas in 1837. Pop. (1960) 33,047; (1970) 41,349.

VICTORIA, State of the Commonwealth of Australia, bounded on the N. by New South Wales, on the E. and S. by the Tasman Sea and the Bass Strait, and on the W. by South Australia. Victoria is traversed from W. to E. by an irregular range of mountains, an extension of the Great Dividing Range. The mountains are low in the W., but rise toward the E. into the rugged Australian Alps, whose highest peak in Victoria is Mt. Bogong (6508 ft.). The coast is lined with broken ranges of hills and is irregular, with granitic headlands and landlocked bays, such as Port Phillip, the harbor of Melbourne. Among the several navigable rivers, those on the N. watersheds are tributaries of the Murray R., which forms most of the boundary on the side of New South Wales. More than eighty extinct volcanic peaks occur just W. of Port Phillip and basaltic flows mark some of the plains. The capital and largest city of the State is Melbourne (pop., 1971) 2,388,941. Area of Victoria, 87,884 sq.mi.; pop. (1972 est.) 3,546,146.

Pulpit Rock, a dominating feature of Mount Buffalo National Park, in Victoria, Australia.

Australian News & Information Bureau



The mountains and drift deposits of Victoria are rich in minerals, of which gold has been most important. About two thirds of the enormous gold production of Australia was obtained in the State, but the economic importance of Victoria's gold production has decreased recently. Lignite or brown coal is currently the major mineral. Farming plays a leading role in the economy, and dairying is a major industry. The chief crops are wheat, oats, barley, potatoes, hay, and grapes. Cattle, sheep, and pigs are raised. Wool, meats, wheat, butter, fruits, skins, milk products, and flour are leading exports. Fabricated metal products; textiles, clothing, and footwear; transport equipment; and food, beverages, and tobacco are processed.

Railroads total about 4170 mi. and paved roads about 60,000 mi. Melbourne is an international air- and seaport.

Some 2200 public elementary and secondary schools and 570 private schools had about 600,000 and 191,000 students, respectively, in the early 1970's. The University of Melbourne (1853), Monash University (1958), and La Trobe University (1964), with a total enrollment of some 26,000 students, are in the Melbourne area.

Government. Executive power is nominally vested in a governor representing the British crown. Actual power is exercised by a prime minister and a cabinet. The legislature consists of a parliament of two houses—the legislative council of thirty-six members elected for six years, and the legislative assembly of seventy-three members elected for three years.

History. The southeastern coast was sighted by the British explorer Captain James Cook (q.v.) in 1770. The harbor of Port Phillip was discovered in 1801, and a settlement on the coast was made in 1835. From 1836 to 1851 Port Phillip was administered by New South Wales, but in the latter year the district was constituted the colony of Victoria, with a separate executive and legislature. Melbourne was created a city in 1847. Gold was discovered in 1851.

VICTORIA, city and provincial capital of British Columbia, Canada, located at the S.E. tip of Vancouver Island. The city is one of the leading ports on the W. coast of Canada. Industries include shipbuilding and ship repair, fish processing, and the production of lumber and other wood products. Because of its mild climate, Victoria has drawn numerous migrants from other parts of Canada. The city began in 1843 as Fort Camosun, a fur-trading outpost for the Hudson's Bay Company. It was the capital of the Crown Colony of Vancouver Island from 1850 to

1866; in 1871 it became capital of the new province of British Columbia. It is the site of Victoria University, founded in 1963. Other notable institutions include the Dominion Astrophysical Observatory and the British Columbia Provincial Museum. Pop. (1976) 62,551.

VICTORIA. See HONG KONG: *People and Principal Cities*.

VICTORIA, in full ALEXANDRINA VICTORIA (1819–1901), Queen of the United Kingdom of Great Britain and Ireland (1837–1901) and Empress of India (1876–1901), born in Kensington Palace, London. Her mother was Victoria Mary Louisa (1786–1861), daughter of the duke of Saxe-Coburg-Saalfeld, and her father was Edward Augustus (1767–1820), Duke of Kent and Strathern, the fourth son of George III (q.v.), and youngest brother of George IV and William IV (qq.v.), kings of Great Britain. Because William IV had no legitimate children, his niece Victoria became heir apparent to the British crown upon his accession in 1830. On June 20, 1837, with the death of William IV, she became queen at the age of eighteen.

Early in her reign Victoria developed a serious concern with affairs of state, guided by her first prime minister, William Lamb, 2nd Viscount Melbourne (q.v.). Melbourne was leader of that wing of the Whig (q.v.) Party which became known as the Liberal Party (q.v.) about 1839. He exercised a strongly progressive influence on the political thinking of the queen.

Marriage. In 1840 Victoria was married to her first cousin, Albert (q.v.), prince of Saxe-Coburg-Gotha, whom she had known for about four years. Although this was a marriage of state, it was a highly romantic and successful one, and Victoria was devoted to her domestic responsibilities. The first of their nine children was Victoria Adelaide Mary Louise (1840–1901), later empress of Germany. Their first son, Albert Edward, Prince of Wales and later king of Great Britain as Edward VII (q.v.), was born in 1841. When the conservative Prince Albert convinced her that Liberal Party policy jeopardized the future of the crown, the queen began to lose her enthusiasm for the party. After 1841, when the Melbourne government fell and Sir Robert Peel (q.v.) became prime minister, Victoria was an ardent supporter of the Conservative Party (q.v.). Also under Albert's influence, she began to question the tradition that restricted the British sovereign to an advisory role. In 1850 she challenged the authority of Henry John Temple, 3rd Viscount Palmerston (q.v.), foreign secretary in the Liberal Party government that had been in power since 1846. Her position was that the sov-

ereign should at least be consulted on foreign policy. But Palmerston adhered to tradition and ignored the request. Their struggle reached a climax in 1851, when the prime minister, Lord John Russell (q.v.), who was also displeased with Palmerston's arbitrary methods, dismissed him from the foreign office. Their altercations with Palmerston, one of the most highly regarded political leaders in the country, caused Victoria and Albert to lose some of the esteem of their subjects. Their popularity dwindled even more in 1854, when they tried to avert the Crimean War (q.v.). After the war had begun, however, they gave it their wholehearted support. In 1856, shortly before the end of the war, the queen instituted the Victoria Cross (q.v.), the highest British award for wartime valor.

In 1857, Victoria had the title of prince consort bestowed on Albert. Four years later he died, and she remained in virtual mourning for much of the rest of her life. She avoided public appearances, letting the prince of Wales fulfill most of the royal ceremonial duties. But her detailed personal interest in the affairs of state continued, and she constantly met with her ministers.

Reign After 1861. Several prime ministers served during the latter part of Victoria's reign, but only the Conservative Party leader Benjamin Disraeli (see *under* DISRAELI), who held office in 1868 and from 1874 to 1880, gained her confidence. He ingratiated himself with the queen by a cultivated personal approach and flattering gifts. He also allowed her a free hand in the awarding of church, military, and some political appointments. She fully endorsed his policy of strengthening and extending the British Empire, and in 1876, Disraeli secured for her the title of empress of India; see INDIA: *History*. She rarely agreed with the brilliant leader of the Liberal Party, William Ewart Gladstone (q.v.), who served as prime minister four times between 1868 and 1894. Victoria disapproved of his High-Church religious attitude, the democratic reforms he enunciated, such as abolishing the purchase of military commissions and legalizing trade unions, and his powerful intellectualized method of argument. She was also strongly opposed to his policy of home rule for Ireland; see IRELAND: *History: The Period of English Supremacy: The Union*. The Conservative leader Robert Arthur Talbot Gascoyne-Cecil, 3rd Marquis of Salisbury (see *under* CECIL), who served as prime minister three times between 1885 and 1902, more often found favor with the queen. Like Disraeli, he advocated protecting British interests and increasing British influence abroad.

VICTORIA



Queen Victoria of England (after a portrait by the 19th century Austrian artist Heinrich von Angeli)

British Information Services

British Idol. Victoria's popularity reached its height in the last two decades of her reign, and it was shared by all classes in British society. Her golden jubilee in 1887 and her diamond jubilee in 1897 were occasions for great public rejoicing. Her subjects were then enjoying an unprecedented period of prosperous complacency, and her enthusiastic execution of the South African War (q.v.) increased her appeal at home and abroad. Victoria died on Jan. 22, 1901. Her sixty-three-year reign was the longest in the history of England. Her descendants, including forty grandchildren, married into almost every royal family of Europe.

With her personal example of honesty, patriotism, and devotion to family life, Victoria became a living symbol of the solidity of the British Empire. The many years of her reign, often referred to as the Victorian age, encompassed the industrial revolution (q.v.) and the rise of the middle class, and they were characterized

by a deeply conservative morality and intense nationalism.

Victoria's correspondence was published in three series, *Letters, 1837-61* (3 vol., 1907), *Letters, 1862-85* (3 vol., 1926), and *Letters, 1886-1901* (3 vol., 1930-32).

See also GREAT BRITAIN: *History: The Victorian Age.*

VICTORIA CROSS, British award for extraordinary bravery in combat. The award was founded in 1856 by Queen Victoria at the end of the Crimean War (qq.v.). It may be conferred on members of the British naval and military services, of the mercantile marine if subject to enemy action, and of the nursing and hospital services, and on civilians serving under orders of the armed forces. The Victoria Cross is in the form of a bronze Maltese cross. In the center is the royal crown, surmounted by the British lion, and below, on a scroll, the words "For Valour". Prior to 1918 the ribbon on which the cross hung was red for the army and blue for the navy, but now it is uniformly red.

VICTORIA FALLS, waterfall in s. central Africa, on the Zambezi R., on the border between Rhodesia and Zambia. The river, here nearly 1 mi. wide, suddenly plunges to a depth of 400 ft. Below the falls, spanning the gorge, a railroad bridge was completed in 1905. The name Victoria was given to the falls by the Scottish missionary and explorer David Livingstone (q.v.), who discovered them in 1855.

VICTORIA, LAKE, or VICTORIA NYANZA, lake in e. central Africa, bordered by Uganda, Kenya, and Tanzania. It has an area of 26,828 sq.mi., and lies 3775 ft. above sea level. The lake is drained by the Nile R., and its chief feeder is the Kagera. The lake was discovered by the British explorer John Hanning Speke (q.v.) in 1858, circumnavigated by Sir Henry Morton Stanley (q.v.) in 1875, and subsequently explored at various times by him and others. During World War I the lake was the scene of military operations between the British and German forces in 1915-16, both sides arming little steamers for raiding purposes. Belgian columns arrived at Kagera, in German territory, in April, 1916, and Ukerewe Island was captured by British forces in June. In July, with the fall to the British of Mwanza all hostilities ended on Lake Victoria.

VICTORIA LAND, or SOUTH VICTORIA LAND, region in Antarctica, s. of New Zealand, bounded by Ross Sea to the w. and Wilkes Land to the e. In Victoria Land are the extinct volcanoes Erebus and Terror, which were discovered by the British explorer Sir James Clark Ross (see under Ross) in 1841.

VICTORIA NYANZA. See VICTORIA, LAKE.

VICUÑA, common name applied to a ruminant mammal, *Vicugna vicugna*, belonging to the Camel family, Camelidae. The animal is native to the Andes Mts. in Ecuador, Peru, and Bolivia, and is a close relative of the domesticated llama (q.v.). Vicuñas are small, slender animals with orange-red fur and generally roam in small herds. The animals have never been successfully domesticated and are much hunted for their



Vicuña, *Vicugna vicugna*

New York Zoological Society

hides and for their wool (q.v.), which is valued for weaving. The term "vicuña" is applied to the fabrics manufactured from the wool of the animal and also to textile fabrics made from the wool of the Merino sheep in imitation of natural vicuña; see SHEEP. Such fabrics generally resemble serge in weave, but are fuller, softer, and have a distinct nap.

VIDEO TAPE RECORDING. See SOUND RECORDING.

VIENNA, independent city of Virginia, about 10 miles N.W. of Arlington. Located in a truck-farm region, Vienna is primarily residential. It was founded in 1794 and was incorporated in 1890. Wolf Trap Farm Park for the Performing Arts is there: Pop. (1960) 11,440; (1970) 17,152.

VIENNA (Ger. *Wien*; anc. *Vindobona*), capital and largest city of Austria, coextensive with Vienna Province, in the E. part of the country. The city lies on both banks of the Danube R. and on the Danube Canal. It is an important port and a major European railroad center.

Commerce and Industry. The principal industries of Vienna include the manufacture of heavy steel and iron machinery, electrical equipment, optical and scientific instruments, chemicals, textiles and clothing, furniture, handicrafts (jewelry, porcelain, glass, and leather goods), paper, hardware, beer, musical instruments, and gold, silver, bronze, and tin products. The city is also a major commercial center.

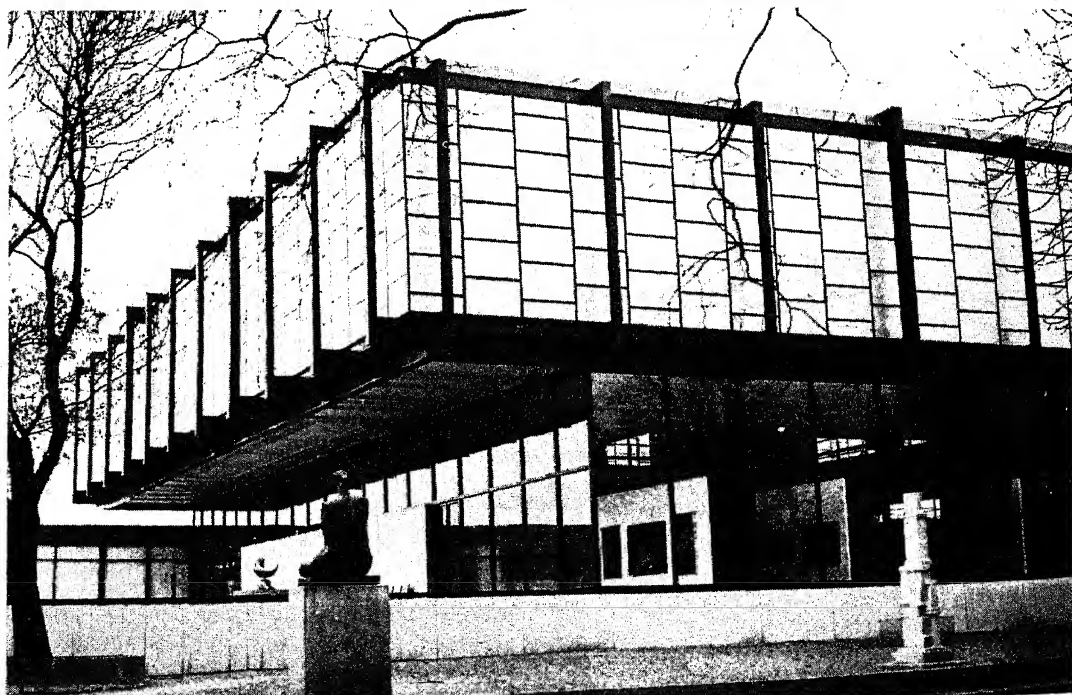
Buildings. Although Vienna contains buildings of the 13th and 14th centuries, it is essentially a modern city. The Ringstrasse, a boulevard 2 mi. long and 150 ft. wide, circles the old Inner City, the hub of the twenty-three districts of Vienna. The Ringstrasse was constructed after the fortifications of the Inner City were removed between 1858 and 1860. Situated in the Inner City are the Cathedral of Saint Stephen, a 12th-century Gothic structure, rebuilt after a fire in 1258, with a 450-ft. tower; the Hofburg, formerly the imperial palace, a complex of buildings that now houses state offices and the National Library, which contains more than 1,800,000 books, illuminated manuscripts, and papyri; and the Church of the Augustinians, a 14th-century Gothic structure, which contains a mosaic of the "Last Supper" of Leonardo da Vinci (q.v.) recreated by the Italian artist Giacomo Raffaelli (1770?-1804?). Bordering the Ringstrasse are numerous parks and buildings, including museums of art and natural history, the houses of parliament, the opera house, the palace of justice, the city hall, and the Burgtheater. The principal public park in Vienna, the Prater, is situated on an island formed by the Danube R. and canal; it is about 4 mi. long and 2 mi. wide. Near the city is the Wienerwald, a forest in the foothills of the Eastern Alps (see ALPS), which has been glorified in Austrian literature and music.

Cultural Institutions. The most outstanding of Vienna's many schools and scientific organizations is the University of Vienna (q.v.), founded in 1365, which is renowned for its medical school. The International Atomic Energy Agency (q.v.) has its headquarters in the city. Vienna is also known as a city of music. The composers Ludwig van Beethoven, Joseph Haydn, Wolfgang Amadeus Mozart, Franz Schubert (qq.v.), and Johann Strauss (see under STRAUSS) lived and worked in Vienna during various periods in their careers. Before the German army marched



Architectural landmarks of Vienna, Austria. Above: The Rathaus (city hall) constructed 1872-83. Below: The Museum of the Twentieth Century was originally built as the Austrian Pavilion at the Brussels World's Fair of 1958. The structure was dismantled after the closing of the fair and reconstructed at its present location in Schweizergarten Park and opened in 1962.

ÖFVW-Egger



into Austria in 1938, Vienna was renowned for the inventiveness of its theatrical ensemble, a reputation the city has regained slowly after the end of World War II.

History. Prior to the Roman occupation in the 1st century A.D., the town was a Celtic settlement; see CELTIC PEOPLES AND LANGUAGES. The Roman emperor Marcus Aurelius (q.v.) is supposed to have died here in 180 A.D. Vienna declined in importance during the next two centuries, and in 450 the Huns (q.v.), under King Attila (q.v.), pillaged the city. It was later taken by the Avars (q.v.), but at the close of the 8th century the Frankish king Charlemagne (q.v.) subdued the Avars and captured the city. In the 12th century Vienna became the residence of the Babenberg dukes of Austria. The traffic across Europe during the period of the Crusades (q.v.) caused Vienna to prosper. The city was enlarged in the 13th century and soon afterward became the capital of the Hapsburg (q.v.) emperors. In 1477 the city resisted a siege by the Hungarians, but in 1485 it fell to the Hungarian king Matthias Corvinus (q.v.). The Ottoman Turks twice besieged Vienna without success, in 1529 and 1683. Polish and German forces assisted in defeating the Turks during the second siege. In 1735 and 1738 treaties were concluded at Vienna in connection with the War of the Polish Succession; see SUCCESSION WARS. In 1805 and 1809 Vienna was, for a brief period, occupied by Napoleon I (q.v.), Emperor of France, and the battles of Aspern and Wagram were fought in its environs; see NAPOLEONIC WARS. The Congress of Vienna, which followed the Napoleonic Wars, was held in the city during 1814 and 1815; see VIENNA, CONGRESS OF. During the Revolution of 1848 (q.v.), a liberal uprising occurred in Vienna, and the emperor, Ferdinand I (see under FERDINAND), was forced to abdicate and was succeeded by Francis Joseph I (q.v.).

After World War I, Vienna became the capital of the Federated Austrian Republic, and in 1921 the province of Vienna was created. During the period between the two world wars, the city was often the scene of riots and strikes. The most serious rioting took place in 1934 after the Socialist Party, which had brought about important housing reforms in the 1920's, was outlawed by the national government. In the same year an uprising by Austrian National Socialists, although quickly suppressed, resulted in the assassination of Engelbert Dollfuss (q.v.), the Austrian chancellor. Following World War II, Vienna was divided into four zones controlled by the occupying powers, the United States, France, Great Britain, and the Soviet Union; the

city was made the seat of the Allied Council, the supreme governing body of occupied Austria. In May, 1955, the joint military occupation of Austria was ended and the second Austrian republic was proclaimed, with Vienna as the capital. The city soon became the seat of international organizations such as the International Atomic Energy Agency and the United Nations Industrial Development Organization. In June, 1961, Vienna was the scene of the meeting between President John F. Kennedy of the U.S. and Premier Nikita S. Khrushchev (qq.v.) of the Soviet Union. In April, 1970, the Strategic Arms Limitation Talks between the U.S. and the Soviet Union, which had begun in Helsinki, Finland, in November of the previous year, reopened in Vienna.

Population. The city and province of Vienna cover an area of 160 sq.mi. The population in 1971 (census) was 1,614,841.

VIENNA, CONGRESS OF, European conference held in Vienna from September, 1814, to June, 1815. It was called to reestablish the territorial divisions of Europe at the conclusion of the Napoleonic Wars (q.v.) after the downfall of the French emperor Napoleon I (q.v.).

Prominent Delegates. Representatives of all the European powers, except Turkey, assembled at the Congress, which was interrupted in February, 1815, by Napoleon's escape from Elba. Most conspicuous among the numerous monarchs who attended the Congress was Alexander I, Emperor of Russia (see under ALEXANDER), who supported such generally unpopular causes as the unification of the German States and the establishment of a constitutional government in Poland. Of the diplomats, Prince Klemens von Metternich (q.v.), the Austrian minister of state who acted as the president of the congress, played what was probably the most prominent part in the negotiations. The French diplomat Charles Maurice de Talleyrand-Perigord (q.v.), who represented the restored French king Louis XVIII (q.v.), succeeded in securing for France an equal share in the deliberations, despite the fact that the major powers, Great Britain, Russia, Prussia, and Austria, had agreed that neither France nor Spain, nor any of the smaller powers, should be party to any important decisions. Great Britain was represented mainly by her foreign minister Robert Stewart, Viscount Castlereagh (q.v.), and by British general and statesman Arthur Wellesley, 1st Duke of Wellington (q.v.). The principal delegate from Prussia was Prince Carl August von Hardenberg (q.v.).

Major Decisions. As a result of the negotiations at the Congress, France was deprived of all

VIENNA, UNIVERSITY OF

the territory conquered by Napoleon; the Dutch Republic was united with the Austrian Netherlands to form a single kingdom of the Netherlands under the house of Orange (see WILLIAM I, King of the Netherlands); Norway and Sweden were joined under a single ruler; and the independence and neutrality of Switzerland were guaranteed, with the union of its cantons reconstituted as a loose confederation. In addition, Russia received the major part of the former duchy of Warsaw as the kingdom of Poland; Prussia received West Prussia, Posen (now the Polish province of Poznan), the northern half of Saxony, and the greater part of the provinces of the Rhine and Westphalia; Hannover received territorial additions and became a kingdom; Austria was given back most of the territory it had recently lost and was compensated in Germany, Italy, and Illyria (now in Yugoslavia) for the loss of the Austrian Netherlands; Britain kept Cape Colony in South Africa, Ceylon, Mauritius, Helgoland, and Malta; the king of Sardinia recovered Piedmont, Nice, and Savoy and received Genoa; the Bourbon king Ferdinand I (q.v.) was restored to the Kingdom of the Two Sicilies; and the duchy of Parma was bestowed on Napoleon's wife, Marie Louise (1791-1847) of Austria. A territorial commission was convened at Frankfurt, and by 1819 it had established the Germanic Confederation, which united thirty-nine sovereign states, including Prussia, under the presidency of Austria.

The Congress took the important step of condemning the slave trade and also provided for freedom of navigation on rivers that traversed several states or formed boundaries between states. Its chief accomplishment was in reestablishing a balance of power among the countries of Europe, with the result that the peace of Europe remained practically undisturbed for forty years.

See also the history sections of the articles on most of the countries mentioned.

VIENNA, UNIVERSITY OF, coeducational institution of higher learning located in Vienna, Austria. It is under the jurisdiction of the ministry of education and is supported by the national government. The university, one of the oldest and most famous of Europe, was founded in 1365 by Rudolf IV of Hapsburg, Duke of Austria (1339-65), and its status was confirmed the same year by Pope Urban V (see under URBAN). The university consists of the faculties of Catholic theology, Protestant theology, law and political science, medicine, and philosophy and natural sciences. Also attached to the university are seminaries, museums, laboratories in art and sci-

ences, and a great many medical and dental clinics associated with the faculty of medicine. Many of the clinics, run by eminent specialists, have attained a worldwide reputation. The degree of *Doktor* is awarded after four or five years of study and indicates a level of accomplishment in between those represented by the American degrees of master and doctor. The main university library contains about 1,750,000 bound volumes. In 1972-73 the student body numbered about 21,000 and the faculty, about 1400.

VIENTIANE, city, port, and capital of Laos, on the Mekong R., about 130 miles s.e. of Luang Prabang. It is an important marketing center, with a trade in teak and other hardwoods, gum benzoin, stick lac, textiles, and skins. Noteworthy features of the town include a modern airport, Sisavangvong University, several ancient pagodas, a museum of antiquities, and the old royal residence.

On the division of the ancient Lao kingdom of Lane Xang into two kingdoms late in the 17th century, Vientiane became the capital of the kingdom of the same name. In 1827, when the Siamese seized control of Vientiane kingdom, the city was virtually destroyed. Vientiane was made the administrative capital of the newly created state of Laos in 1946. Pop. (1970 est.) 150,000.

VIETNAM, officially SOCIALIST REPUBLIC OF VIETNAM, republic of s.e. Asia, bordered on the n. by the People's Republic of China, on the e. by the Gulf of Tonkin and the South China Sea, on the s. by the South China Sea, and on the w. by the Gulf of Siam, Cambodia, and Laos. The nation lies approximately between lat. 8°33' N. and lat. 23°2' N. and long. 102°11' E. and long. 109°28' E. The area of Vietnam is about 129,607 sq.mi. From 1954 to 1976 Vietnam was divided into two republics—the Democratic Republic of Vietnam, or North Vietnam, and the Republic of Vietnam, or South Vietnam. The boundary between the states was roughly delineated as lat. 17° N. by the 1954 Geneva Conference; see *History*, below; see also INDOCHINA.

Prior to 1954 the entities that comprise present-day Vietnam formed part of French Indochina. Those entities were, in the n., Tonkin (q.v.); in the central region, Annam (q.v.); and, in the s., Cochinchina (q.v.). Cochinchina and southern Annam were included in South Vietnam; Tonkin and northern Annam formed North Vietnam.

Vietnam as a whole extends in a n.-s. direction for 1000 mi.; from e. to w. it ranges from a maximum of 300 mi. in the extreme n. to a mini-

mum of 25 mi. in the center. The area of former South Vietnam was 66,263 sq.mi., and the area of former North Vietnam was 63,344 sq.mi.

THE LAND

The major land form is the Annamese Highlands, a rugged upland mass extending in an S-shaped curve from the Chinese border through almost the entire length of Vietnam. This upland area reaches heights of 8000 ft. The upland is a series of small plateaus which slope from E. to W. and which are broken by several passes.

Between the Annamese Highlands and the South China Sea lie three physiographic regions which, although much smaller in total area than the Annamese Highlands, are far greater in economic importance. These regions are, from N. to S., the Tonkin lowland, the Annam coastal plains, and the Mekong lowland.

The Tonkin lowland measures approximately 6000 sq.mi. The surface is largely a delta and plain made up of sedimentary materials deposited by the Red R. (Song Coi) and its major tributaries, the Black R. (Song Bo) to the S. and the Clear R. (Song Lo) to the N. The lowland is subject to serious flooding between June and September.

The Mekong lowland lies partly in S. Vietnam and partly in Cambodia. It comprises a plain and delta area far more extensive than that of the Tonkin lowland. The delta of the Mekong R. alone has an area of some 14,000 sq.mi. The Me-

kong R. crosses the lowland in Vietnam in the form of two major branches, or distributaries, and a number of smaller connecting streams. The natural channels are linked by artificial canals, which help to drain the delta. The mouths of the distributary streams are marked by shifting mud banks which build up rapidly through sedimentation.

The Annam coastal plains extend along the coast between the Red and Mekong deltas. The plains are a series of small alluvial expanses contiguous to the N. but cut into a series of isolated pockets by mountain spurs in the S.

Climate. The climate of Vietnam is largely of the tropical-monsoon variety; as such, it is characterized by relatively high and even temperatures, high humidity, rainy summers, and dry winters. Important modifications of this general pattern occur. The climate of the Mekong lowland is typified by that of Ho Chi Minh City (Saigon), which is situated on the E. deltaic margin. The average yearly rainfall in the city is 80 in., almost all of which is concentrated from May to October. Temperature readings in Ho Chi Minh City average 86° F. in May and drop slowly to an average of 80° F. in December.

In Hanoi, in the Red R. delta, rainfall, which is concentrated largely from May to September,

A fishing boat with sails furled on Vung Ha Long, a bay near Hanoi between the mainland and the island of Dao Cat Ba. The bay is famous for the beauty of its grottoes.

Andreas Luppi-Black Star



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averages about 72 in. annually. Temperature contrasts are greater than in s. Vietnam; in Hanoi the maximum of 85° F. is reached in July, and January temperatures average 63° F.

The coast between the Red and Mekong deltas has a somewhat different rainfall pattern. During the fall and winter the winds of the n.e. monsoon (q.v.) blow directly on shore, bringing heavy precipitation. Thus, Hue, on the central coast, receives much of its annual rainfall of about 100 in. from September through December. In the late spring and summer the prevailing winds of the s.w. monsoon, having lost their moisture over the Annamese Highlands, are relatively dry when they reach the coast.

Natural Resources. Vietnam has moderate mineral resources; most of the known deposits are in n. Vietnam. The principal mineral is coal, deposits of which are concentrated along the n. flank of the Red R. delta. The deposits consist largely of a high-grade anthracite which can be made into coke. Total reserves of coal are estimated at 20 billion tons. The only known coal deposit in s. Vietnam is small.

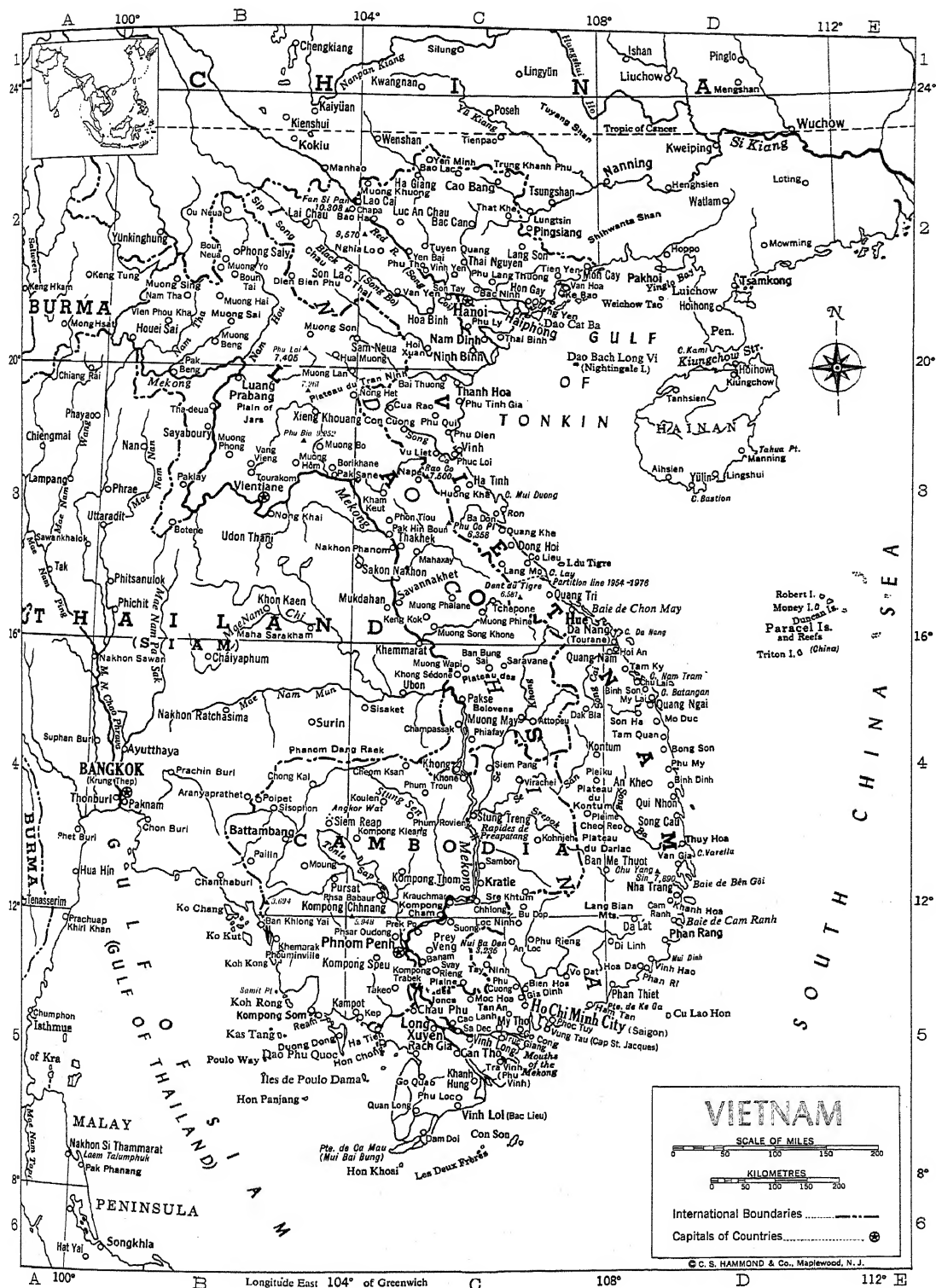
Zinc and tin are found in deposits located near the Chinese border. In several locations near the Red R. delta deposits of iron ore are found. These deposits are little exploited and total reserves are not known. Antimony, manga-

nese, tungsten, lead, silver, and phosphate rock also are found near the Red R. delta. Major offshore deposits of petroleum were reported to be near the s. coast.

Plants. Four distinct types of plant cover are found in Vietnam, namely tropical rain forest, monsoon forest, savanna, and mangrove swamp. The tropical rain forest is encountered where rainfall averages more than 80 in. per year and the dry season is not pronounced; in the less accessible hill portions of such areas a great variety of commercially valuable trees are found. The monsoon forest, which is notable because the trees shed during the dry season, occupies hilly areas and interior basins where the yearly rainfall is between 60 in. and 80 in. The savanna is typical of areas where soils are relatively poor and where shifting cultivation has necessitated the clearing of woodlands. Dense stands of mangrove occur along the muddy tidal flats of the Red and Mekong deltas.

Animals. Buffalo, deer, elephants, panthers, and tigers are numerous, especially in the mountainous areas of the s. Fish are abundant in coastal waters as well as in rivers and lakes.

Soils. Three distinct types of soil are found in Vietnam, namely alluvial soil, red soil, and red-gray soil. Alluvial soils, which are the most important to the economy, occur in both lowland





Typically heavy traffic in downtown Ho Chi Minh City. The number of bicycles has grown since the war, and motorized two-wheelers create a steady din.

Marc Riboud-Magnum

areas, the deposits attaining maximum depths of several thousand feet. The high temperatures and heavy rainfall of Vietnam tend to leach organic materials from the alluvial soils. Periodic flooding deposits new mantles of unleached soil, however, which help to keep the lowland areas fertile. The red soil, or *terre rouge*, developed through partial leaching of the basaltic materials in the Annamese Highlands. This soil provides good sites for plantation agriculture. In regions containing sandstone and ancient, elevated alluvial terraces, leaching produces red-gray soils, which tend to be infertile.

Energy. Vietnam is well endowed with water-power potential, but it had not been harnessed substantially by the late 1970's. The Red R., in the N., could be developed into an important source of hydroelectricity, and projects on the upper Mekong R., such as at Khone Falls in Laos, could provide Vietnam with power. In the mid-1970's Vietnam yearly produced 2.09 billion kw hours of electricity; more than 80 percent was generated in thermal plants.

THE PEOPLE

About 90 percent of the Vietnamese population are of Annamite stock. The Annamites make up the vast majority of the population in the lowlands and have penetrated into the Annamese Highlands to some degree. Considerable numbers of Chinese have emigrated into the Mekong and the Red R. delta areas. In the mid-1970's Chinese composed almost 7 percent of the lowland population in the Mekong delta and constituted a somewhat larger percentage in the Red R. delta. Significant numbers of Chinese reportedly left Vietnam in 1977-78. In the mountainous sections of the N. are a variety of peoples, including the Thai, Muong, Man, and Meo. Indonesians and Moi peoples predominate in the S. mountainous areas. In the W. sections of S. Vietnam Cambodians compose about 5 percent of the population.

Population. The United Nations estimated the population of Vietnam at 47,870,000 in 1977; most of the people lived in rural areas. Historically, the Red R. delta has been the most densely populated region of the country; in the 1970's it had an average population density of about 1200 persons per sq.mi., with local densities of up to 3500 persons per sq.mi. The Mekong delta

had an average density of only about 250 persons per sq.mi., largely because of the lack of adequate projects to control seasonal river flooding. Densities of 600 persons per sq.mi. occur in some parts of the coastal plain. The Annamese Highlands are sparsely populated.

During the war in Vietnam (1958-75) many peasants, especially in the s., fled their homes and went to live in urban areas. In 1975 the government began to relocate large numbers of these people in so-called New Economic Zones, situated in the countryside, in order to reduce overcrowding in the cities.

Political Divisions. Vietnam is divided into thirty-five provinces plus the independent municipalities of Haiphong, Hanoi, and Ho Chi Minh City (formerly Saigon).

Principal Cities. The capital of Vietnam is Hanoi (pop., 1976 est., 1,443,500), an industrial and commercial center on the Red R. Other major cities include Ho Chi Minh City (3,460,500), a commercial and transportation center; Haiphong (1,190,900), a major port and rail center; Da Nang (pop., 1973 est., 492,194), a busy port on the South China Sea; Nha Trang (216,227), a major fishing port; Qui Nhon (213,757), a coastal transportation hub; and Hue (209,043), a commercial center with a rich history.

Religion. Buddhism in various forms is the religion of most of the Vietnamese people. The principal Buddhist sects are the Buddhist Unified Church, to which the majority belong, the Jetavana Vihara sect with some 10,000 adherents, and the Hoa Hao numbering about 1,500,000. Cao daism, a synthesis of Buddhism, Confucian-

ism, Taoism, and Christianity, claims about 1,500,000 adherents. Nearly all of the approximately 2,000,000 Roman Catholics in Vietnam were concentrated in s. Vietnam following the division of the country in 1954.

Languages. The official language of Vietnam is Vietnamese, which also is the most widely used language. Until 1954 French was the language of government, and in the 1970's it was still an important language of commerce in the s. Dialects of s. China, especially Cantonese, are in widespread use. Some minority groups in the Mekong delta area use Khmer dialects; various Thai dialects are employed in the s. sections of the Annamese Highlands. In the n. mountains a great variety of languages, including Miao, Yau, Kui, and Muong, is spoken, but none of these is widespread or of great importance in trade. See also SINO-TIBETAN LANGUAGES.

Education. Education in Vietnam is now widespread and the rate of illiteracy is relatively low. During the years of French occupation educational facilities were expanded somewhat. Lower grades were taught in the indigenous languages, but university training, which was restricted to a small number, was in French. In former South Vietnam, English was also used, especially in medical schools.

ELEMENTARY AND SECONDARY SCHOOLS. In the mid-1970's, following the end of the Vietnam war, there were reported to be about 12,600,000 elementary and secondary school students in

A Vietnamese woman tends her wares in the flower market of Haiphong, an important northern city.

Marc Riboud-Magnum



VIETNAM

Vietnam, with about 300,000 teachers. Included in this total were pupils enrolled in technical and vocational schools. The status of private schools in the s. following the Communist takeover in 1975 was unclear.

UNIVERSITIES AND COLLEGES. There are 4 universities in Vietnam: the University of Can Tho (enrollment in 1975, about 4520); the University of Hanoi (1500 students); the University of Hue (6250 students); and the University of Ho Chi Minh City, formerly the University of Saigon (7000 students). The universities in the s. were reorganized by the government in 1975. There are about 15 scientific and technical institutes, mostly located in the n.; they have a combined enrollment of roughly 200,000 students.

Culture. Classical Chinese and Indian influences on the Vietnamese culture are seen today in art forms of the Vietnamese language and in the importance accorded to the family and to learning and age. The nearly 100 years of French rule brought modernization, the French system of education and jurisprudence, technical development, and private enterprise.

LIBRARIES AND MUSEUMS. Southern Vietnam has limited library facilities. Major museums are located in Ho Chi Minh City and Hue. Northern Vietnam reorganized its library system in 1954, and in the late 1970's it included the national library in Hanoi and several public libraries in the cities and provinces. In addition, a number of collections are housed at universities, vocational and technical institutions, and in the ministries.

LITERATURE. Early Vietnamese literature derived from the Chinese, and it was not until the 17th century that Vietnam developed its own written language. The Vietnamese tend to express themselves in poetry, and their literature also has a preoccupation with the supernatural.

ART. Vietnamese painting combines both Oriental and Occidental influences. Architecture and sculpture show influences of China, France, and the United States. The sculpture is primarily religious, and is usually found in the home as well as in houses of worship.

MUSIC. Music in Vietnam was originally dictated by the imperial court at Hue and was extremely ritualistic. Since the 19th century, amateurs have influenced and altered the quality of music. Modern music in Vietnam has lost much of its tradition and tends more toward Western instruments and influences.

THE ECONOMY

The economy of Vietnam is predominantly agricultural. The n. half of the country has most of the nation's heavy industry and mineral re-

sources, and the s. half has the most productive rice-growing areas as well as the great commercial center of Ho Chi Minh City. During the war in Vietnam (1958-75) both halves of the country suffered extensive damage (see *History*, below). Millions of peasants moved to urban areas, where most had difficulty finding suitable housing and work. High rates of inflation and unemployment were major problems in the s. during the mid-1970's.

In 1976 the government of unified Vietnam adopted a five-year economic plan covering 1976-80. The plan gave priority to reconstructing and developing the country's agriculture and to setting up additional light industries. The government in the late 1970's also sought to establish a socialist economic system in the s., but a considerable amount of private enterprise was still allowed in 1977. In the n. both agriculture and manufacturing had been reorganized in the 1950's along traditional socialist lines.

Agriculture. About 16 percent of Vietnam's land area is arable, and the chief crop produced is paddy rice, the mainstay of the Vietnamese diet. In 1976 about 12,000,000 metric tons of rice were produced. This amount did not cover the country's needs, however, and some 1,200,000 metric tons of rice had to be imported. Other important Vietnamese farm commodities (with approximate production figures, in metric tons, for 1976) included sweet potatoes (1,200,000), cassava (1,150,000), maize (320,000), sugarcane (900,000), groundnuts (95,000), dry beans and soybeans (60,000), bananas (480,000), coconuts (130,000), tea (9000), and tobacco leaves (21,000). Industrial commodities included jute (21,000), natural rubber (22,000), and cotton lint (3000). Large amounts of green vegetables were grown in small gardens.

Animal husbandry is not highly developed in Vietnam. Buffalo (2,260,000 head in 1976) and cattle (1,850,000) are used mainly as draft animals. Hogs (11,500,000) are raised principally for their meat, of which 410,000 metric tons were produced in 1976. The country also has large numbers of chickens (56,000,000) and ducks (36,000,000), raised both for their meat and for their eggs.

Fishing and Forestry. Fresh and dried fish are major items of the Vietnamese diet. Freshwater fish are caught in rivers, canals, artificial ponds, and rice fields where pisciculture is practiced. Marine fishing is a chief occupation in many coastal communities; most fishing craft are small, limiting activity to nearby waters. The fish catch in 1975 totaled about 1,013,000 metric tons, approximately 75 percent of which was



A street vendor in Ho Chi Minh City sits among edibles and handicrafts. In tropical Vietnam, alfresco commerce is the norm, and almost any product can be purchased in the street.
George Holton-Photo Researchers, Inc.

made up of marine fish. The chief species caught are striped tuna, bonito, mackerel, shrimp, and crayfish.

About 35 percent of Vietnam is covered with woodland or forest. In the mid-1970's an estimated 650,000,000 cu.ft. of timber were produced yearly.

Mining. The leading product, by far, of Vietnam's relatively small mining industry is coal. In the mid-1970's the country annually produced about 4,250,000 metric tons of coal; almost all of the mines were located in the N. Other mineral products (with the annual output, in metric tons, during the mid-1970's) included cement (685,000), chromite (9000), phosphate rock (1,500,000), salt (350,000), and tin (250).

Manufacturing. Much of Vietnam's industrial plant was damaged or destroyed in the 1960's and early 1970's, during the war in Vietnam. By the late 1970's, however, most factories had

been reconstructed, and some new plants had been established. The country's leading fabricated goods are processed food, beverages, textiles, clothing, construction materials, iron and steel, machinery, forest products, and chemicals. Most of the country's small number of large manufacturing plants are situated in the N. Handicrafts and cottage industries remained important segments of the Vietnamese economy in the late 1970's; products of such small-scale enterprises included pottery, simple tools made of scrap iron and wood, and a great variety of bamboo goods.

Currency. The currency of Vietnam is the dong (2.15 dong equal U.S.\$1; 1978), which is divided into 100 xu. The currency is issued by the State Bank of Vietnam, in Hanoi.

VIETNAM

Foreign Trade. Vietnam engages in a modest foreign trade, and it generally imports much more than it exports. External analysts estimated that the country's 1976 imports cost \$831,000,000, while its exports earned only \$227,000,000. The principal imports were foodstuffs, machinery, refined petroleum, chemicals, and transportation equipment; the chief exports were clothing, fish, rubber, coal, tea, bananas, and handicrafts. The leading trade partners were the Soviet Union, the People's Republic of China, Japan, East Germany, and Hong Kong.

Transportation. Vietnam has very limited modern transportation facilities, and human energy moves a large percentage of people and goods in comparison with Western industrial countries. Bicycles are an important mode of transport, as are small nonmotorized boats. In the mid-1970's the country had a network of about 107,400 mi. of roads, many of them narrow and unpaved routes. Most of Vietnam's railroads were badly damaged during the warfare of the 1960's and early 1970's. In the late 1970's about 1500 mi. of track were in operation; a line connecting Hanoi and Ho Chi Minh City was opened in 1976. The country had more than 3415 mi. of navigable inland waterways, including the Mekong and Red rivers as well as smaller streams and canals. These waterways were important arteries for local trade, which also was handled by small vessels that moved along Viet-

nam's approximately 1400 mi. of coastline. The nation had few large oceangoing ships. The country had one airline, government-run Air Viet Nam, which provided domestic service and operated a few international flights. The main airports were at Gia Lam (near Hanoi), Ho Chi Minh City, Phu Bai, Da Nang, Vinh, and Dong Hoi.

Communications. In the mid-1970's Vietnam had a small number of daily newspapers. These included *The People*, *People's Army*, and *New Hanoi*, published in Hanoi, and *Great Union* and *Morning News*, published in Ho Chi Minh City. There also were some 45 regional periodicals. Radio and television broadcasting was controlled by the government; the Voice of Vietnam, headquartered in Hanoi, transmitted radio programs in several languages. About 2,000,000 television receivers were in use in the country.

Labor. The work force of Vietnam included about 22,000,000 persons in the mid-1970's. The great majority were engaged in agriculture. The country's principal labor organization was the Vietnam General Federation of Trade Unions.

GOVERNMENT

Under the Geneva Agreement of 1954, Vietnam was to be temporarily divided, pending national elections in 1956. The reunifying elections were not held, however, and Vietnam remained divided.

South Vietnam adopted a republican form of government in 1955; under its 1967 constitution, executive power was vested in a popularly elected president. In early 1975 the republican

A tugboat passes a settlement on the banks of the Saigon River. River transportation is extremely important in Vietnam.

Phyllis McCutcheon-Photo Researchers, Inc.



government was overthrown when its armed forces were defeated by a combination of South Vietnamese rebel forces and North Vietnamese troops. Pending reunification of the country, the Provisional Revolutionary Government (P.R.G.) became the principal executive authority in South Vietnam. The P.R.G., which had been founded in 1969 to administer regions captured from the republican government, was headed by a prime minister who presided over a nine-member cabinet.

From 1954 North Vietnam was organized as the Democratic Republic of Vietnam. Executive authority was vested in a Council of Ministers, made up of a premier, several deputy premiers, and various ministers. The council was responsible to the unicameral National Assembly, comprising 420 members elected to four-year terms. The government of North Vietnam was controlled by the Lao-Dong Party (see *Political Parties*, below), whose first secretary was the most powerful person in the country.

On April 25, 1976, North Vietnam and South Vietnam elected a joint National Assembly. On July 2, during its inaugural session, the assembly adopted measures that reunited the two Vietnams as the Socialist Republic of Vietnam. A draft constitution for the new nation was presented to the assembly, and it was still undergoing the ratification process in late 1978.

Central Government. The head of state of Vietnam is a president, who has little power and whose duties are mainly ceremonial. The president is elected to a four-year term by the National Assembly. The country also has 2 vice-presidents. The chief executive of the government is a premier, who heads a cabinet made up of 7 deputy premiers and about 33 other ministers. The premier and cabinet are responsible to the National Assembly. In practice, the government is dominated by the principal political party of the country.

HEALTH AND WELFARE. According to the World Health Organization, a specialized agency of the U.N., three decades of warfare left Vietnam ravaged by widespread malaria, tuberculosis, leprosy, bubonic plague, venereal disease, and drug abuse. Major health problems in Vietnam were caused by the destruction of numerous community health care centers, hospitals, and medical research institutes.

Legislature. Legislative power in Vietnam is vested in an elected National Assembly, made up of 492 members. The region formerly included in North Vietnam is represented by 249 deputies, and the area that once comprised South Vietnam has 243 representatives. The as-

sembly meets for short sessions, and when it is not in session many of its functions are carried out by a small standing committee, headed by a chairman.

Political Parties. The most important political party in Vietnam is the Communist Party of Vietnam (Dang Cong san Vietnam). It was founded in 1976 as the successor to the Vietnamese Workers' Party (Lao-Dong Party). The Communist Party is headed by a general secretary, who oversees the work of the fourteen-member political bureau, or politburo, which is the governing body of the organization. The party controls the government of Vietnam.

A few other political parties, such as the Democratic Party (founded 1944) and the Socialist Party (founded 1946), are also active, but they have very small memberships and exert little influence on the government.

Local Government. Vietnam is divided into 35 provinces and 3 independent municipalities (Hanoi, Haiphong, and Ho Chi Minh City). Local units of government include popularly elected people's councils, which are headed by administrative committees.

Defense. According to estimates by external analysts, the regular armed forces of Vietnam in 1977 included an army of 600,000 persons, an air force of 12,000 persons, and a navy of 3000 persons. Following the defeat of South Vietnam in 1975, the Communist government confiscated large quantities of modern American-made armaments and equipment. The country also received sophisticated weapons from the Soviet Union, so that in the late 1970's Vietnam was considered to have one of the best-equipped armed forces in Asia. The nation's paramilitary forces included about 1,600,000 persons in 1977. The armed forces of South Vietnam, estimated at 560,000 uniformed troops in 1974, had been demobilized in May, 1975.

HISTORY

A detailed account of the history of the area comprising present-day Vietnam prior to 1954 is given in the article *INDOCHINA*. In that year armistice agreements signed in Geneva, Switzerland, ended the war between France and the North Vietnamese government of Vietminh leader Ho Chi Minh (q.v.). Vietnam was officially partitioned, with the 17th parallel as the armistice line. The agreement provided that within two years elections were to be held in both areas for a single government; that French forces were to withdraw from North Vietnam, and Vietminh forces from South Vietnam, Laos, and Cambodia; and that the Vietnamese people were to have freedom of movement between North and

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South Vietnam until mid-1955. About 800,000 persons, including large segments of the Roman Catholic population, availed themselves of the last-named provision by moving from North Vietnam to South Vietnam.

The Diem Regime. Early in 1955 North Vietnam proposed that discussions be held to arrange for the scheduled reunifying elections. South Vietnam, not a signatory of the Geneva agreements and contending that voting under the Communist regime of North Vietnam would not be free, rejected the proposals. On Oct. 23, as the result of a referendum, Bao Dai, head of the pro-French government in South Vietnam, was deposed and Ngo Dinh Diem (1901-63), his premier, became chief of state. Three days later Diem proclaimed the Republic of Vietnam with himself as president. Diem again refused to consider the all-Vietnamese elections. In October, 1956, a constitution approved earlier that year by an elected assembly made up largely of Diem supporters went into effect.

In 1957-58 acts of terrorism against local officials became frequent in South Vietnam. The guerrilla groups attempting to overthrow the government came to be called Vietcong, or Vietnamese Communists. The struggle widened into a war between South Vietnam and North Vietnam, frequently spilling over into Laos and Cambodia, Vietnam's neighbors to the west. Ultimately the war became an international conflict with the U.S. and several other countries supporting South Vietnam and the U.S.S.R. and Communist China supporting North Vietnam and the Vietcong. For details on the warfare and its repercussions, see VIETNAM, WAR IN.

During 1959 North Vietnam was accused of aggression by Laos. A U.N. fact-finding commission reported that pro-Communist rebels in Laos had been supplied by North Vietnam with military equipment and personnel.

In South Vietnam legislative elections held during 1959 gave nearly all the seats to Diem supporters. In 1960 factions within South Vietnam pressed for government reforms and a military coup was attempted unsuccessfully on Nov. 11. In December the leadership of the guerrilla groups announced the formation of the National Front for the Liberation of South Vietnam as the political arm of the opposition forces.

When Diem was reelected the following April, voter turnout was low and there were charges of fraud and intimidation of voters. Communist infiltration from North Vietnam, perennially a problem, increased during Diem's second term, and on Aug. 2, 1961, U.S. President John F. Kennedy (q.v.) declared that South Viet-

nam would not be allowed to fall under Communist control. In addition to continuing U.S. economic aid, several thousand American troops were sent into the country, primarily to train and transport indigenous forces to fight against the pro-Communist guerrilla forces. Many U.S. observers, however, began to criticize the Diem regime and suggest that it was unwise for the U.S. to become too closely identified with it.

In 1962 North Vietnam, which had not previously admitted involvement in Laos, withdrew troops from that country in compliance with an international agreement providing for Laotian neutrality. In South Vietnam, Buddhists, who constitute a majority, charged they were oppressed by the rule of the Catholic Diem family, and in 1963 staged demonstrations during which several of them dramatized their opposition to Diem's rule by burning themselves to death. In the fall Madame Nhu, wife of Diem's brother, Ngo Dinh Nhu (1911-63), visited the United States in an attempt to justify the Diem policies. During her visit Diem was deposed, on Nov. 1, in an army-backed revolt that reportedly had tacit U.S. approval; he and Nhu were arrested and killed. A military junta established a provisional government, which was overthrown on Jan. 30, 1964.

Election of Thieu and Ky. During the next few years changes of government were frequent in South Vietnam as the political and military situations continued to deteriorate. In January, 1966, General Nguyen Cao Ky (1930-), former air force commander and then premier, pledged to hold a referendum in October on a new constitution for South Vietnam that would lead to democratic elections in the next year. On Feb. 6-8, U.S. President Lyndon B. Johnson (q.v.) met with Ky and other Vietnamese officials in Honolulu and issued the "Declaration of Honolulu" outlining future U.S. and South Vietnamese policies and calling for a war on social injustice as well as a military war.

The new South Vietnamese constitution providing for a democratically elected government went into effect on April 1, 1967. On Sept. 3, General Nguyen Van Thieu (1923-), the head of state, was elected president and Premier Ky elected vice-president of South Vietnam. Although opposition parties charged that the elections were rigged, U.S. observers backed the elections as legitimate.

Peace Talks. In January, 1968, the North Vietnamese announced their willingness to begin peace talks, long sought by the U.S. government, if the U.S. would unconditionally halt its bomb-



Former presidential palace, Saigon (now Ho Chi Minh City), as it looked in the mid-1960's. This neoclassic relic of the French colonial period was damaged during the war and rebuilt along modern lines.

Richard L. Carlton-Photo Researchers, Inc.

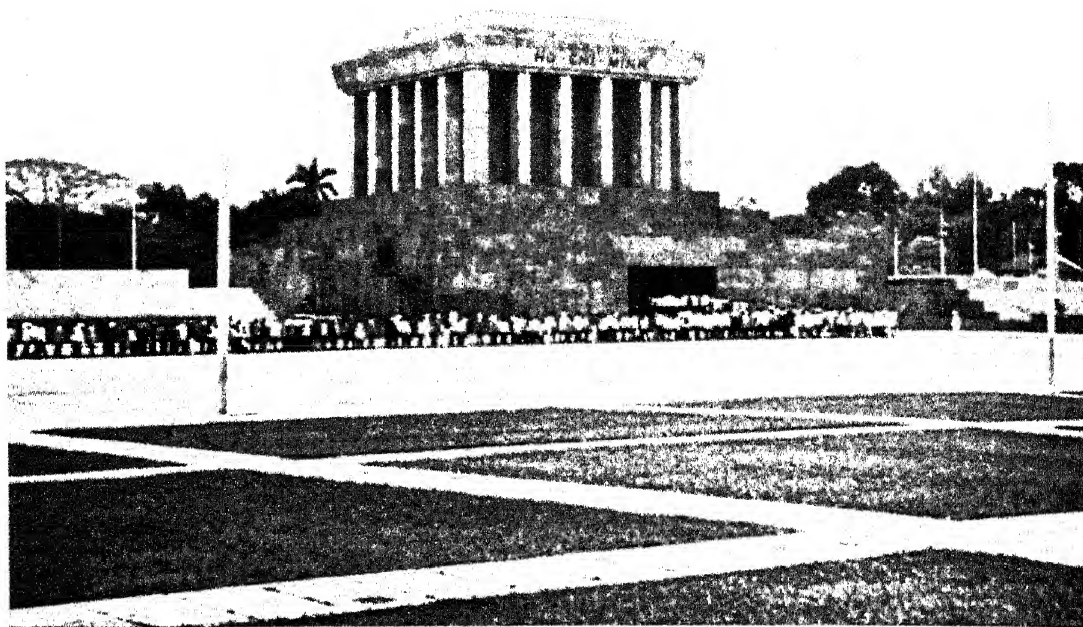
ing raids on North Vietnam. These peace overtures were opposed by South Vietnamese President Thieu. On Jan. 30, Communist troops launched their heaviest offensive of the war. Known as the Tet offensive, the attack involved assaults on about 100 locations in South Vietnam. American and South Vietnamese forces turned back the offensive in heavy fighting, during which both sides suffered large losses. On March 31, President Johnson announced bombing restrictions and called on Hanoi to enter peace talks; and on April 3, the U.S. and North Vietnam agreed to establish direct contacts. Preliminary talks were delayed by disputes about the meeting place, but on May 13, negotiations officially began in Paris, France. The fighting continued, however. On Nov. 26, the South Vietnamese government, which had not taken part in the negotiations that led to the meetings in Paris, agreed to cease its boycott of the talks and, on Jan. 16, 1969, the U.S. and North Vietnam reached agreement on physical arrangements for expanded talks, overcoming the final major procedural impediment to substantive negotiations. Representatives of the newly formed Provisional Revolutionary Government of the National Liberation Front were also to participate; this government was recognized in June, 1969, by sixteen Communist and neutral nations.

Death of Ho Chi Minh. On Sept. 3, 1969, North Vietnamese President Ho Chi Minh died.

He was succeeded by Ton Duc Thang (1888–), formerly vice-president of North Vietnam, who instituted no substantive changes in policy.

In 1970 North Vietnam and the Vietcong intensified operations in Cambodia, from which Hanoi withdrew its diplomats in March, following a government coup; see CAMBODIA: *History*. The North Vietnamese signed agreements for economic and military aid from Communist China in May, and in June with the Soviet Union for similar assistance. At the peace negotiations in Paris, progress was hindered by the North Vietnamese response to the U.S.-South Vietnamese military incursion into Cambodia, which took place in April in order to destroy alleged Communist sanctuaries. The Hanoi government remained cool to proposals both for private negotiations with the U.S. and an international conference on Indochina.

South Vietnam meanwhile recognized the new Western-oriented government in Cambodia and called for "close cooperation in the struggle against Communist aggression". After the major thrust into Cambodia, involving some 20,000 U.S. and South Vietnamese troops, was concluded and all American ground forces were withdrawn on June 29, South Vietnam agreed to provide direct military aid to Cambodia.



The mausoleum of Ho Chi Minh (1890-1969), in Hanoi. The revered revolutionary leader of North Vietnam drove the French out in 1954, but died before the achievement (in 1976) of his ultimate goal: a united Vietnam.
Terzani-Sygma

American Troop Withdrawal and the 1971 Elections. As the gradual American troop withdrawal and the so-called Vietnamization of the war continued, the Thieu government faced antigovernment peace demonstrations and growing popular disenchantment with alleged governmental repression and corruption. In the months preceding the 1971 presidential elections, candidates Ky and General Duong Van Minh (1916-) repeatedly charged the incumbent Thieu with manipulating the contest to ensure his own victory. Thieu had secured passage of a new election law requiring candidates to obtain the written endorsement of at least forty national assemblymen. Ky, unable to obtain sufficient endorsements, was ruled ineligible by the South Vietnamese Supreme Court. General Minh then withdrew his candidacy in protest, and Thieu, the only presidential contender on the ballot, was reelected.

A U.S.-proposed peace plan, made known early in 1972, called for new presidential elections in South Vietnam. As planned, President Thieu would resign a month prior to the balloting and the elections would be administered by an independent body composed of all competing political groups.

Events in Saigon. The major upheaval of the war in 1972 was the battle for Quang Tri. When the provincial capital was overrun by the North Vietnamese in their offensive of April and May, Thieu declared a state of emergency and of mar-

tial law. Quang Tri was recaptured by the South Vietnamese forces at great cost on Sept. 17.

Despite continuing antigovernment activity by the Vietcong in and near Saigon, President Thieu managed to strengthen his domestic powers. With the passage of a bill on June 27, 1972, he won virtually dictatorial authority to rule, for the next six months, on all matters pertaining to national defense and security. Through regulations and pressure, he also took measures against Saigon newspapers critical of his policies; and many of these papers had ceased publication by September. After declaring martial law on July 15, Thieu appointed some forty military men to head the administration of South Vietnam's 10,755 hamlets, and thereby abrogated local democratic elections.

Continuing Negotiations. At Paris the North Vietnamese remained firm in desiring an unconditional date of withdrawal of U.S. troops from Vietnam. President Nixon's peace plan made public on Jan. 25, 1972, set a six-month date from signing a treaty, but Hanoi did not accept the stipulation that withdrawal include all foreign troops. In July North Vietnamese negotiator Le Duc Tho (1911-) resumed private meetings in Paris with Henry A. Kissinger (q.v.), President Nixon's adviser on national security.

A particularly vexing problem throughout the long negotiations concerned the political disposition or role of President Thieu's government in the postwar period. The Vietcong, represented in Paris by Nguyen Van Tien and later by Nguyen Thi Binh, wanted to take part in a coalition government in South Vietnam. Both Kissinger and his aide, General Alexander Meigs Haig, Jr. (1924–), made repeated trips to Saigon to reassure Thieu that the U.S. would not betray his government in the negotiations.

Terms of Peace. An accord signed in Paris on Jan. 27, 1973, guaranteed South Vietnam's political independence and self-determination, and established the National Council of National Reconciliation and Concord to organize South Vietnamese elections. Both the Saigon government and the Vietcong would be party to this council. For more details on the cease-fire, see *VIETNAM, WAR IN: Temporary Peace*.

Implementing the Agreement. By the end of March, with all U.S. prisoners of war released and all American ground troops withdrawn from South Vietnam, the long U.S. military involvement in the country was ended. As to the political future of South Vietnam, representatives of Saigon and the Vietcong opened reconciliation talks in Paris, in March, but the talks quickly became deadlocked.

Throughout 1973, however, there were repeated serious violations of the cease-fire. In response, Kissinger and Le Duc Tho met in May, June, and December to discuss ways of ending the violations. An International Commission on Control and Supervision, consisting of Canada, Hungary, Indonesia, and Poland, was established, but it had minimal success in ending the fighting and in stopping infiltrations of North Vietnamese into South Vietnam.

South Vietnam Surrenders. President Thieu lost much support in 1974, as economic conditions grew critical because of uncontrolled inflation and high unemployment (both largely the result of sharply reduced U.S. aid).

At the end of 1974 the North Vietnamese and their Southern allies began a major offensive that soon met with success; by mid-March, 1975, the war had become a rout. Thieu resigned on April 21. On April 30, Saigon was captured by the North Vietnamese and their allies, and South Vietnam surrendered. In the previous days and hours, remaining U.S. personnel were hastily evacuated. In addition, about 125,000 Vietnamese fled the country amid great confusion; most of them were resettled in the U.S.

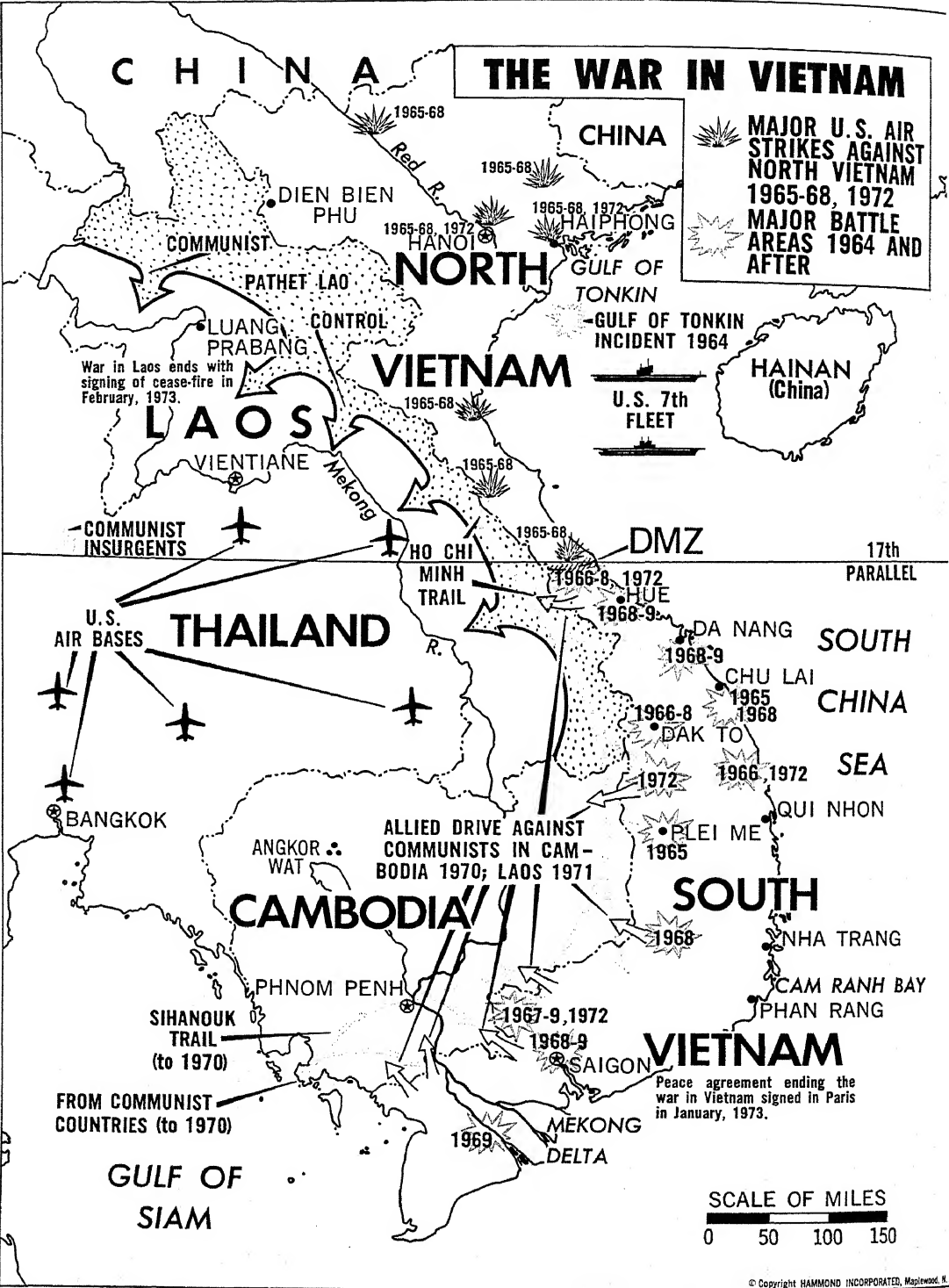
After the end of the civil war, the principal administrative body in South Vietnam was the

Provisional Revolutionary Government, which was controlled by North Vietnam. On April 25, 1976, a joint National Assembly for North and South Vietnam was elected, and on July 2 the assembly adopted measures that reunited the country as the Socialist Republic of Vietnam. Hanoi was made the capital of the nation, and Saigon was officially renamed Ho Chi Minh City. The first president of the new republic was Ton Duc Thang, and the initial premier was Pham Van Dong (1906–). Le Duan (1908–), the general secretary of the Communist Party of Vietnam, was the most influential political leader. The country became a member of the U.N. in 1977.

In late 1976 the government inaugurated a five-year program of rebuilding the nation and increasing its agricultural output. Considerable aid was received from the Soviet Union and other nations of Eastern Europe. The new regime sought to establish a socialist system in s. Vietnam, and many persons were moved from the cities to so-called New Economic Zones in the countryside. Restrictions placed on ethnic Chinese businessmen in Vietnam strained relations with China; many ethnic Chinese reportedly fled to China, and there were some border clashes between Vietnamese and Chinese troops in 1977–78. At the same time, Vietnamese forces and troops of neighboring Cambodia engaged in sporadic heavy fighting, and by late 1978 Vietnam actually occupied large tracts of E. Cambodia. In January, 1979, the Vietnamese, allied with Cambodian rebels, launched an all-out offensive, captured Phnom Penh, and toppled the Chinese-backed regime. In retaliation the Chinese invaded Vietnam in February and March. Chinese forces penetrated some 25 mi. into the country before pulling out again, having allegedly taught the Vietnamese "a lesson".

During and after the invasion the flight of the ethnic Chinese increased dramatically, putting a severe strain on neighboring countries where they sought asylum. The plight of these and other Vietnamese refugees, called "boat people" because of their means of escape, became a matter of international concern in the spring and summer of 1979.

VIETNAM, WAR IN, military struggle fought in Vietnam from 1958 to 1975. It began as a determined attempt by Vietcong, or Communist guerrillas (q.v.), backed by Communist North Vietnam, to overthrow the government of South Vietnam. The struggle widened into a war between South Vietnam and North Vietnam and ultimately into a limited international conflict; the United States and several other countries





supported South Vietnam by supplying troops and munitions, and the U.S.S.R. and the People's Republic of China furnished munitions to North Vietnam and the Vietcong. This article is concerned primarily with the military aspects of the war. For further discussion of political issues in Vietnam, see *VIETNAM: History*.

Vietnam, 1945–54: Establishment and Partitioning. The war developed as a sequel to the struggle (1946–54) between the French, who were the rulers of Indochina prior to World War II, and the Communist Vietminh, members of the League for the Independence of Vietnam. The league was headed by Vietnamese leader Ho Chi Minh (q.v.). Having emerged as the strongest of the nationalist groups that fought the Japanese occupation of Vietnam during World War II, the league was determined to resist the reestablishment of French colonial rule.

Following the surrender of Japan to the Allies in August, 1945, Vietminh guerrillas seized the capital city of Hanoi (now capital of North Vietnam) and forced the abdication of Emperor Bao Dai. On September 2 they declared Vietnam to be independent and announced the creation of the Democratic Republic of Vietnam (D.R.V.N.). France officially recognized the new state, but the subsequent inability of both sides to reach satisfactory political and economic agreements led to armed conflict in December, 1946. As the war progressed, the French sought to enlist non-Communist support by turning to Bao Dai as a rallying point for the Vietnamese.

French forces, in spite of heroic resistance at Dien Bien Phu, were defeated in 1954.
UPI

With French approval, Bao Dai set up the State of Vietnam on July 1, 1949, and established a new capital at Saigon (now capital of South Vietnam).

The following year, the U.S. officially recognized the Saigon government and to assist it, U.S. President Harry S. Truman (q.v.) dispatched a 35-man military assistance advisory group to advise the troops in South Vietnam on the use of American weapons. In the meantime, the two main adversaries in Vietnam were steadily building up their forces until an army of 258,000 French troops stood ranged against 300,000 Vietminh. The decisive battle of the war developed in the spring of 1954 as the Vietminh attacked the French fortress of Dien Bien Phu in northern Vietnam. On May 8, 1954, after a 55-day siege, the French surrendered, having suffered some 16,000 casualties against an estimated 20,000 Vietminh killed and wounded.

On the same day delegates of France, Great Britain, the Soviet Union, the U.S., the D.R.V.N., the State of Vietnam, Communist China, and the two other Indochinese states, Laos and Cambodia, met in Geneva, Switzerland, to discuss the future of all of Indochina. Under accords drawn up at the conference, France and the D.R.V.N. agreed to a truce in Vietnam. It was further agreed to partition the country temporarily along the 17th parallel, with the north going to the Communists and the south placed

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under the control of the Saigon government. The agreement stipulated that reunification elections would be held in 1956.

Neither the U.S. nor the Saigon governments agreed to the Geneva accords, but the U.S. announced it would not do anything to undermine the agreement. Once the French had withdrawn from Vietnam, the U.S. moved to bolster the Saigon government militarily and, as asserted by some observers, engaged in sabotage activities against the Hanoi government. On Oct. 24, 1954, President Dwight D. Eisenhower (q.v.) offered South Vietnam direct economic aid, and the following February, U.S. military advisers were dispatched to train South Vietnamese forces. American support for the Saigon government continued even after Bao Dai was deposed, in a referendum on Oct. 23, 1955, and South Vietnam was made a republic, with Ngo Dinh Diem (1901–63) as president. One of the first acts of the new president was to announce that his government would refuse to hold reunification elections, on the grounds that the people of North Vietnam would not be free to express their will and because of the probability of falsified votes.

The New War Begins. The position taken by Diem won the backing of the U.S. The Communist government in Hanoi, however, indicated its determination to reunify the nation under Hanoi. The truce arranged at Geneva began to crumble and by January, 1957, the International Control Commission set up to implement the Geneva accords was reporting armistice violations by both North and South Vietnam. Throughout the rest of the year, Communist sympathizers who had gone north after partition began returning south in increasing numbers. Called "Vietcong," they began launching attacks on U.S. military installations that had been established, and in 1958 began their attack on the Diem government.

The attacks continued throughout the following year and were intensified in 1960, the year in which North Vietnam openly proclaimed its intention "to liberate South Vietnam from the ruling yoke of the U.S. imperialists and their henchmen". The statement served to reinforce the belief that the Vietcong were being directed by Hanoi. On November 10, the Saigon government charged that regular North Vietnamese troops were taking part directly in Vietcong attacks in South Vietnam. To show that the guerrilla movement was independent, however, the Vietcong set up their own political arm, known as the National Liberation Front (N.L.F.), with its headquarters in Hanoi.

Social and Political Turbulence in South Vietnam. In the face of the deteriorating situation, the U.S. reexpressed its support for Saigon. In April, 1961, a treaty of amity and economic relations was signed with South Vietnam, and in December, U.S. President John F. Kennedy (q.v.) pledged to help South Vietnam maintain its independence. Subsequently, U.S. economic and military assistance to the Diem government increased significantly. In December, 1961, the first U.S. combat troops, consisting of 400 uniformed army officers and men, arrived in Saigon to operate two helicopter companies, although the U.S. proclaimed that the troops were not combat units as such. A year later, however, U.S. military strength in Vietnam stood at 11,200 men.

The Diem government, meanwhile, proved unable to defeat the Communists or to cope with growing unrest among South Vietnamese Buddhists and other sects. Antigovernment agitation among the Buddhists was especially strong, with many burning themselves to death as a sign of protest. Still others were placed under arrest, the government charging that the Buddhist groups had become infiltrated by politically hostile persons, including Communists. The contention was supported by outside observers, including a U.S. fact-finding team sent to Saigon by Kennedy at Diem's request.

The team, headed by Defense Secretary Robert S. McNamara and General Maxwell D. Taylor (qq.v.), chairman of the joint chiefs of staff, was still in Saigon when the Diem regime was overthrown in a military coup on Nov. 1, 1963. Diem and his controversial brother and political adviser, Ngo Dinh Nhu, were executed. The circumstances surrounding the coup were not fully clear at the time it happened. In the summer of 1971, however, with the publication by the American press of a secret Pentagon study of the war (see *Controversy Stateside*, below), it was revealed that the coup was known to be imminent and that the U.S. was prepared to support a successor government.

The government that replaced the Diem regime was a revolutionary council headed by Brigadier General Duong Van Minh (1916–). A series of other coups followed, however, and in the 18 months after Diem's overthrow South Vietnam was to have ten different governments. None of these proved capable of dealing effectively with the country's military situation.

Deepening U.S. Involvement. Unlike conventional wars, the war in Vietnam had no recognizable front lines. Much of it consisted of hit-and-run attacks, with the guerrillas striking



A detachment of helicopter-borne U.S. marines take off on a search and destroy mission over the demilitarized zone in 1967.

UPI

at scattered government outposts and retreating into the jungle. North Vietnamese troops had begun to infiltrate into South Vietnam in increasing numbers to help the Vietcong. The war escalated still more sharply in the first week of August, 1964, when North Vietnamese torpedo boats were reported to have attacked two U.S. destroyers in the Gulf of Tonkin. Acting on the authorization of Congress to repel armed attack, U.S. President Lyndon B. Johnson (q.v.) ordered American jets to South Vietnam and the retaliatory bombing of military targets in North Vietnam. In February, 1965, U.S. planes began regular bombing raids over North Vietnam. A halt was ordered in May in the hope of initiating peace talks, but when North Vietnam rejected all negotiations, the bombings were resumed.

In the meantime, the U.S. continued to build up its troop strength in South Vietnam. On March 6, 1965, a brigade of American marines landed at Danang, south of the demilitarized zone that had originally been set up at the time of partition. The marines, the first U.S. combat ground-force units to serve in the country, brought the number of U.S. military forces in Vietnam to about 27,000. Before the year was out American combat strength increased to nearly 200,000 men.

While continuing the military buildup in Vietnam, the U.S. made another attempt to end the war. In December, 1965, President Johnson again halted the bombing of North Vietnam and launched a worldwide peace offensive. Again he was unsuccessful, and the raids were resumed. In June, 1966, U.S. planes began bombing major installations near Hanoi and the neighboring port of Haiphong, both of which had heretofore been spared.

In October, 1966, government chiefs from the U.S., Australia, New Zealand, Thailand, South Korea, and the Philippines, all troop-contributing countries in South Vietnam, met in Manila and pledged their withdrawal within 6 months after North Vietnam abandoned the war. The withdrawal offer was rejected by North Vietnam. In June, 1967, President Johnson met with Soviet Premier Aleksei N. Kosygin (q.v.) in Glassboro, N.J., and sought his help in bringing Hanoi to the peace table. The war, however, dragged on.

Two months after the Glassboro meeting, President Johnson announced that U.S. forces in Vietnam would be further increased to 525,000 men by 1968. At the same time, U.S. planes extended their bombings of North Vietnam to within 10 mi. of the Chinese border. Shortly thereafter, President Johnson again offered to stop the bombardment of North Vietnam provided peace talks would follow. As in the past, Hanoi rejected the offer.

Peace Talks Open. The war continued and casualty figures rose. On Nov. 30, 1967, the Pentagon (q.v.) announced that total U.S. casualties in Vietnam since the beginning of 1961 had reached 15,058 killed and 109,527 wounded. The mounting toll was accompanied by growing American sentiment for an end to the war, whose cost, apart from the loss of life, was estimated by the President at \$25,000,000,000 per year. The demand for peace became increasingly vocal in Congress and on college campuses.

A turning point in the war appeared near in

VIETNAM, WAR IN

the early spring of 1968. On March 31 President Johnson announced a halt in U.S. bombings over 90 percent of the North Vietnamese population. The announcement, intended as a new peace gesture, evoked a positive response from Hanoi, and on May 13 peace talks between the U.S. and North Vietnam opened in Paris. North Vietnam named the Vietnamese official Xuan Thuy (1912–) as its chief negotiator; the U.S. was represented by American diplomat W. Averell Harriman (see under HARRIMAN). Later in the year, the talks were expanded to include South Vietnam and the National Liberation Front of the Vietcong. The talks, however, made no progress despite the fact that U.S. raids on North Vietnam were completely halted by President Johnson in November.

Vietnamization of the War, 1970–71. Johnson's successor, President Richard M. Nixon (q.v.), named American statesman Henry Cabot Lodge II (see under LODGE) as chief delegate to the Paris peace talks. In a further effort to break the deadlock, President Nixon announced within a few months after taking office that 25,000 U.S. troops would be withdrawn from Vietnam by August, 1969. Another cut of 65,000 men was ordered by the end of the year. The program to be known as Vietnamization of the war came into effect, as President Nixon emphasized additional responsibilities of the South Vietnamese. Neither the U.S. troop reduction, nor the death of North Vietnamese President Ho Chi Minh, on Sept. 3, 1969, served to break the stalemate in Paris; the North Vietnamese delegates continued to insist upon complete U.S. withdrawal as a condition for peace.

In April, 1970, U.S. combat troops entered Cambodia following the occurrence there of a political coup; see CAMBODIA: *History*. Within three months, the U.S. campaign there ended.

In July, 1970, President Nixon announced the appointment of David K. E. Bruce (1898–1977), former ambassador to France, West Germany, and Great Britain, as chief U.S. delegate to the Paris peace talks; Lodge had resigned some months earlier. Bruce served until July, 1971, and was succeeded by William J. Porter (1914–), former U.S. ambassador to South Korea.

By 1971 South Vietnamese forces were playing an increasing role in the war, fighting in both Cambodia and Laos as well as in South Vietnam. At this point, however, the Paris talks and the war itself were overshadowed by the presidential election in South Vietnam. The chief participants were President Nguyen Van Thieu (1923–), who was running for reelection; Vice-President Nguyen Cao Ky (1930–); and former

government head Duong Van Minh. Both Ky and Minh, after charging that the election had been rigged in favor of Thieu, withdrew from the race, leaving the president as the sole candidate. On Oct. 3, 1971, Thieu was reelected to another four-year term.

Through the latter months of 1971, American withdrawal continued. It coincided, however, with a new military buildup in North Vietnam, thought to be in preparation for a major drive down the Ho Chi Minh Trail into Laos and Cambodia. Heavy U.S. air attacks followed throughout the Indochina war sector. On the ground, meanwhile, Vietnamese Communist forces had launched massive attacks against government forces in South Vietnam, Cambodia, and Laos. All three were suffering sharp reverses at the hands of the Communist troops as the year ended and 1972 began. It was feared also that Hanoi might launch a major offensive in South Vietnam's central highlands, timing the operation for the Vietnamese Tet, or Lunar New Year, holiday in mid-February.

Casualty figures in 1971 reflected the intensification of South Vietnam's own fighting efforts against the Communists. American deaths in Vietnam declined dramatically to 1380, compared to 4221 in 1970. The Saigon forces, on the other hand, suffered about 21,500 dead, some in Cambodia and Laos but the majority in South Vietnam; the toll claimed against the enemy was 97,000 dead. The high South Vietnamese figure, however, had to be measured against the fact that the enemy made no successful offensive of any real importance in South Vietnam in 1971. **Controversy Stateside.** Prior to troop withdrawal, U.S. military strength in South Vietnam had risen above 541,000 men. In the U.S. itself, as military involvement increased, the war issue became highly controversial. A peace movement developed and gathered momentum, organizing marches and moratoriums against the war in major U.S. cities.

By 1971 the issue of atrocities committed by American troops in Vietnam had become a matter of national concern. Two widely publicized cases that focused attention on the issue were a reported massacre at the village of Mylai in 1968 and the secret execution in 1969 of a Vietcong double agent by members of a Special Forces (q.v.) or Green Berets team. Lieutenant William L. Calley (1943–), charged with responsibility for the deaths of unarmed Vietnamese civilians at Mylai, was found guilty on March 29, 1971, by a military jury and sentenced to life imprisonment at hard labor. The sentence was later reduced to ten years, and in 1974

Calley was released on bail, pending a review of his case.

A major reinterpretation of America's involvement in the Vietnam war was spurred by the controversial publication by the *New York Times* and other newspapers of the so-called Pentagon Papers in 1971, a series of governmental documents revealing the evolution at high levels of U.S. policy in the conflict. The papers cast a new, and to many, a dismaying, light on the American handling of the war and of peace negotiations throughout the 1960's.

Negotiation Impasses. On Jan. 25, 1972, President Nixon publicly recounted the many proposals which the Administration had secretly put before the North Vietnamese during the last two-and-one-half years. At the same time, he unveiled a new eight-point plan for peace in Vietnam, including a new presidential election in South Vietnam.

The Nixon plan was followed by a revised version of a peace plan submitted by the Vietcong in July, 1971. The new version called for the immediate resignation of President Thieu, to be followed by negotiations with the Saigon administration once it had abandoned what the Vietcong called policies of waging war and repression. The same insistence on the immediate resignation of the South Vietnamese president was voiced by Hanoi through the North Vietnamese delegation in Paris, which announced that American prisoners of war would be released only when the U.S. had withdrawn its support from the Thieu administration and the war was brought to an end.

South Vietnamese forces, meanwhile, conducted three drives into Cambodia during February, terming the last a "reconnaissance in force". The U.S. announced that it would no longer disclose the number of planes involved in raids over North Vietnam. Peace talks were broken off on March 23.

Quang Tri Offensive. The tide of the war took an ominous turn for the worse one week later. On March 30 North Vietnam launched a massive tank-and-artillery offensive across the demilitarized zone (DMZ) into Quang Tri Province. In April U.S. B-52's initiated the first deep-penetration bombing raids over the north since 1967. When the North Vietnamese won a major victory on May Day by capturing the city of Quang Tri, gaining control of the province, revived peace talks were again broken off by South Vietnam and the U.S. Despite the awesome invasion from the north, the White House announced the withdrawal of 20,000 more U.S. troops over the next two months.

On May 8 President Nixon ordered the mining of major ports of North Vietnam, notably Haiphong, to interdict enemy supply routes. Air strikes were also directed against North Vietnamese railroad lines. A Hanoi newspaper admitted the intensified bombing was causing serious economic problems, but it also charged that American planes were deliberately bombing dikes. Spokesmen for the White House immediately denied the charge, admitting only to twelve unintentional hits on dikes.

Quang Tri City, after being held by Communist forces for four-and-one-half months, was recaptured by South Vietnamese forces on Sept. 15. The Saigon government claimed 8000 enemy casualties since June 28.

Reescalation. As the war continued into the second half of 1972, secret peace meetings were held at intervals in Paris between White House aide Kissinger and the North Vietnamese delegate Le Duc Tho. A breakthrough was achieved in the Paris talks begun on Oct. 8. For the first time, the Communist side expressed acceptance of a peace plan separating the military from the political settlement of the war, relinquishing their demand for a coalition government in South Vietnam, and agreeing to a formula for simultaneous discussion of Laos and Cambodia. "Peace is at hand" was Kissinger's description of the progress that had been made toward ending the war on Oct. 26. At the same time he disclosed a nine-point peace plan, but technical issues remained unresolved, and President Thieu of South Vietnam called the plan a "sellout". Kissinger further stated that the U.S. had stopped bombing raids above the 20th parallel.

With the resumption of talks between Kissinger and Tho on Dec. 4, general anticipation of a final, signed agreement was perhaps the highest it had been since the beginning of the Paris negotiations in 1968. But the talks abruptly collapsed on Dec. 16, and the following day President Nixon ordered massive bombing of Hanoi and Haiphong. Subsequent night raids by B-52's and attack planes were termed the severest aerial assaults in all of history, and both domestic and world reaction to the sudden reescalation of the bitter conflict was for the most part one of shock. The air attacks also resulted in the loss of fifteen B-52's and in the loss or capture of ninety-three American airmen.

Temporary Peace. Despite the stepping up of American bombing, both sides appeared anxious to salvage the progress made in negotiation. Reaction of Hanoi to the American air raids, as well as that of China and the Soviet



As members of the four-power Joint Military Commission, representing North and South Vietnam, the Vietcong, and the U.S., observe from the background (right), a smiling ex-POW (center) strides toward freedom at Loc Ninh, South Vietnam, on Feb. 13, 1973.

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Union, was surprisingly mild. On Dec. 29, the U.S. announced a halt to the bombing above the 20th parallel, effective the next day.

With the new year came the resumption of the secret peace meetings in Paris. Sensing progress in the first days, President Nixon ordered a halt to all bombing, mining, and artillery fire in North Vietnam. After six days of conferring, Kissinger and Tho met once again on Jan. 23, 1973, and, on that evening, President Nixon announced over nationwide television that agreement on all terms for a formal cease-fire had finally been reached.

On Jan. 27, at the Hotel Majestic in Paris, delegations representing the U.S., South Vietnam, North Vietnam, and the Provisional Revolutionary Government of South Vietnam signed an "Agreement on Ending the War and Restoring Peace in Vietnam"; the agreement included nine chapters and four accompanying protocols. (Because of South Vietnam's nonrecognition of the Provisional Revolutionary Government, specific references to it were confined to a second set of documents signed separately by the U.S. and North Vietnam only.) The cease-fire officially went into effect at 8 A.M. Saigon time on Jan. 28. Both the U.S. and North Vietnam asserted that there were no secret peace terms.

The peace accord called for complete cessation of hostilities; withdrawal of all American

and allied forces from South Vietnam in sixty days of the signing; return of all captured military personnel by both sides at fifteen-day intervals within sixty days; recognition of the DMZ as "only provisional and not a political or territorial boundary"; an international control commission (composed of representatives of Canada, Hungary, Indonesia, and Poland) to oversee implementation of the peace; and provision for an international conference to be held within thirty days. The accord allowed some 145,000 North Vietnamese troops to remain in South Vietnam, but with limitation on their future replacement and supplies.

Cease-Fire Aftermath. By the end of March all U.S. fighting forces had been withdrawn. Silencing the guns of the Vietnamese antagonists, however, proved to be difficult. Fighting died down shortly after the cease-fire, only to be renewed, often intensively, as each side attempted to hold or expand its military positions.

Fighting escalated during 1974, with major engagements occurring throughout the year. In December, 1974, the North Vietnamese and their Southern allies launched a major offensive that quickly resulted in unprecedented success. Beginning in December, the government of South Vietnam lost control of numerous important provincial capitals and other cities; by the time that Hue was captured in mid-March, 1975, the war had become a rout. On April 30, Saigon was captured, and the Republic of Vietnam surrendered unconditionally to the Provisional Revolutionary Government.

Earlier, on April 16, the Cambodian govern-

ment surrendered to Khmer Rouge rebel forces. In June, Laos appeared on the brink of coming under the complete control of the Communist Pathet Lao, which had made major gains in the preceding months. Thus, as the war in Vietnam ended, virtually all of Indochina was controlled by Communist-led governments.

VIEXTEMPS, Henri François Joseph (1820–81), Belgian violinist and composer, born in Verviers. He began to play the violin at an early age and studied under the Belgian violinist and composer Charles Auguste de Beriot (1802–70). In 1833 Viextemps made the first of his many European tours. Later he was received with great enthusiasm in Moscow and Saint Petersburg (now Leningrad). Other successful tours followed, notably those of the United States (1844–45, 1857, and 1870). In 1846 he was appointed court violinist to Nicholas I (q.v.), Emperor of Russia, and in 1871 he became professor of violin at the Brussels Conservatory. As a composer of virtuoso works for the violin Viextemps holds a high place in the esteem of violinists. His compositions include six violin concertos, of which the second (1840) and fifth (1858) are most often played.

VIGILANTES, in the United States, members of volunteer associations known as vigilance committees, organized for the protection of certain common interests such as life and property. Citizens formed vigilance committees to administer summary justice in the absence of a regular judiciary or when courts were prevented from exercising their accustomed functions. In American Revolutionary times, vigilance committees were formed in many communities to enforce the nonimportation agreements, which had been employed by the colonists as a means of resistance to British taxation, and to ferret out Tories, those who sympathized with the British crown rather than with the cause of colonial independence.

Vigilance groups were also effective in frontier areas, where it was not uncommon for vigilantes to capture a suspect and hold trial, sentence, and execute the accused without actual legal officers being present. The most notable instance of the use of vigilance committees as a governmental improvisation occurred in California during 1848 and 1849, when thousands of people immigrated to the area following the discovery of gold. Because no legal government yet existed, citizens supplied the deficiency by organizing vigilance committees to suppress and punish crime. Associations of "regulators", such as the Ku Klux Klan (q.v.), are also described as vigilance societies.

VIGNOLA, Giacomo da, real name GIACOMO BAROCCHIO or GIACOMO BAROZZI (1507–73), Italian architect, born in Vignola, near Modena. In 1550 he was made papal architect by Pope Julius III (1487–1555). His masterpiece is the famous Villa Caprarola, near Viterbo, built (1547–59) for the Italian family of Farnese (q.v.). His design for the Church of Gesù, the principal church of the Jesuits in Rome, begun in 1568, had an important influence on the development of baroque church architecture in Europe.

Vignola's treatise on the five architectural orders, *Regola delli Cinque Ordini d'Architettura* (1563; Eng. trans., *The Five Orders of Architecture*, 1889), became a standard work on the subject and was translated into many languages.

VIGNY, Comte Alfred Victor de (1797–1863), French writer, born in Loches. After twelve years as an officer in the French army, he became a man of letters, associating himself with the literary movement known as Romanticism (q.v.). He established his reputation with his collected *Poèmes Antiques et Modernes* (1826). His best-known works are the historical novel *Cinq-Mars* (1826; Eng. trans., *Cinq-Mars, or A Conspiracy under Louis XIII*, 1847) and the Romantic drama *Chatterton* (1835; Eng. trans., 1908), based on the life of the British poet Thomas Chatterton (q.v.).

VIGO, city and port of Spain, in Pontevedra Province, on an inlet of the Atlantic Ocean, 72 miles N. of Oporto. It is one of the most active ports of Spain, and tunny and sardine fishing are major industries. There are iron foundries, machine shops, petroleum refineries, and food-processing plants. The building of small steamers and the manufacture of cordage are also important industries. The town of Vigo was attacked by the English navigator Sir Francis Drake (q.v.) in 1585 and 1589. Treasure ships from the New World were sunk in the harbor in 1702 by a combined British and Dutch fleet, and it is thought that some of the treasures still lie there on the bottom. Pop. (1970) 197,144.

VIJAYAWADA, formerly BEZWADA, city of the Republic of India, in Andhra Pradesh State, on the Kistna R., about 45 miles N.W. of Machilipatnam. It is an important railway junction and the administrative center of the Kistna irrigation system. Rice milling and cotton processing are the main industries. Pop. (1971) 343,664.

VIKINGS. See NORSEMEN.

VILLA, Francisco, known as PANCHITO VILLA, real name DOROTEO ARANGO (1877–1923), Mexican revolutionary leader, born in Rio Grande. Upon the outbreak of the revolution of 1910–11 against the Mexican dictator Porfirio Díaz (q.v.), Villa offered his services to the rebel



Pancho Villa (center)

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leader Francisco Indalecio Madero (q.v.). During Madero's administration he served under the Mexican general Victoriano Huerta (q.v.), who sentenced him to death for insubordination. Villa escaped to the United States, and following the assassination of Madero and the assumption of power by Huerta in 1913, he returned to join the opposition under revolutionary leader Venustiano Carranza (q.v.). The two men soon became enemies, however, and when Carranza seized power in 1914 Villa formed a rebellion against him. The following year the U.S. government recognized Carranza as president of Mexico, and on March 9, 1916, Villa crossed the border and attacked Columbus, N. Mex., killing a number of citizens and destroying part of the town. A punitive expedition dispatched to Mexico from the U.S. failed to capture Villa. After the overthrow of Carranza in 1920, he came to terms with the new government and retired to a ranch in Durango Province. He was assassinated in 1923.

See MEXICO: *History*.

VILLA-LOBOS, Heitor (1887–1959), Brazilian composer, born in Rio de Janeiro, and primarily self-trained. In 1912 he accompanied a scientific expedition to the interior of Brazil to study the music of Indian tribes, later an important influence on his own music. Villa-Lobos also came in contact with contemporary French music while studying in Paris from 1922 to 1930 on a fellow-

ship from the Brazilian government. After 1931 he held the post of supervisor and director of musical education in the public schools of Rio de Janeiro. In this position he revolutionized public musical education throughout Brazil. He also supervised the systematic accumulation of a large collection of Brazilian folk and popular music, which served to focus nationwide attention on this rich source of musical material. He conducted various orchestras in Brazil, the United States, and Europe.

A prolific composer, Villa-Lobos wrote about 2000 works, employing almost every existing form of musical composition. In his works he did not generally use actual Brazilian folk tunes but rather wrote original melodies in a Brazilian folk style, developing them in his own manner. From a popular Brazilian dance, he developed the *chôros* ("serenade"), expanding its form from the guitar solo of his first *chôros* to the large orchestral and choral ensembles of his later ones. Also famous are his *Bachianas Brasileiras* (1930–45), nine suites, varied in their instrumentation, in which the musical idiom of the German composer Johann Sebastian Bach (see under BACH) is ingeniously blended with the powerful rhythms and melodic styles of the folk music of northeastern Brazil. Villa-Lobos' other works include operas, ballets, symphonies, concertos, chamber music, piano pieces, and songs.

See LATIN-AMERICAN MUSIC: *The National Period*.

VILLANOVAN CULTURE, culture dating from the earliest Iron Age of Italy (about 1000 B.C. to about 700 B.C.) and so called because a cemetery containing remains of the culture was uncovered in 1853 in the town of Villanova, near Bologna. Similar remains were subsequently found widely in northern and north-central Italy. These relics reflect marked advances in the techniques of metalworking over those used by the lake dwellers, who during the earlier Bronze Age inhabited nearby areas in the Po R. basin; see LAKE DWELLINGS. This Greek-influenced metalwork, characterized by repoussé, or hammered, geometric designs, is evidenced by the many weapons, belts, and vessels unearthed in the region of present-day Tuscany.

The culture of the Villanovans, who are believed to have come from central Europe, was similar to the Hallstatt culture (q.v.) of Austria. The Villanovans cremated their dead, placing the ashes in coarse pottery urns decorated with geometric designs. The urns were then buried in graves, usually along with articles of iron and bronze, notably brooches, and also representations of animals that may have been votive offerings. The Villanovans were supplanted by the Etruscans; see ETRURIA.

See ARCHEOLOGY: *Current Research*.

VILLA PARK, village of Illinois, in Du Page Co., on Salt Creek, 17 miles w. of downtown Chicago. Local manufactures include tools and dies, metal and machine products, industrial machinery, and plastic products. The village was incorporated in 1914. Pop. (1960) 20,391, (1970) 25,891.

VILLARD, Henry, original name FERDINAND HEINRICH GUSTAV HILGARD (1835–1900), American journalist, railroad promoter, and financier, born in Speyer, Germany. He adopted the name Villard after immigrating to the United States in 1853. As a newspaper correspondent, he won distinction with his reports on the Lincoln-Douglas debates of 1858 (see LINCOLN, ABRAHAM), the 1858–59 Pikes Peak (q.v.) gold rush, and the Civil War. He subsequently became one of the most important railroad promoters of his time in the nation, organizing the Oregon Railway and Navigation Company in 1879, and in 1881 pooling a number of railway interests and buying a controlling share in the Northern Pacific Railroad. Under his presidency (1881–84), the Northern Pacific completed a transcontinental line. The railroad, however, was faced with a huge deficit and Villard resigned. Later he recouped his losses and rejoined the Northern Pacific's board of directors (1888–93).

Villard also helped finance the early ventures of the American inventor Thomas Alva Edison (q.v.), founded in 1889 the Edison General Electric Company (later the General Electric Company), and acquired a controlling interest in two New York newspapers, the *Evening Post* and the *Nation* (1881). His wife, Helen Frances Garrison Villard (1844–1928), daughter of the American abolitionist William Lloyd Garrison (q.v.), aided the National Association for the Advancement of Colored People (q.v.) and founded the Women's Peace Society (1919–28). Their son, Oswald Garrison Villard (1872–1949), was a distinguished editor and publisher of the New York *Evening Post* and *Nation* (1897–1918), editor and owner of the liberal weekly *The Nation* (1918–32), and author, mainly of historical books.

VILLARRICA, city in Paraguay, capital of Guairá Department, about 80 miles s.e. of Asunción. It lies on a railroad and on the Pan American Highway, in an agricultural area. Industries include food processing, tanning, flour milling, sawmilling, and the production of wine, textiles, and wood products. An Indian market is of note, and a church shrine draws thousands of pilgrims annually. Originally founded as Villa Rica del Espíritu Santo in 1576, the city was moved from the Alto Paraná R. to its present site in 1682, after many attacks from Brazil. Later, German settlers established the wine industry. Pop. (1972 est.) 35,000.

VILLEURBANNE, city of France, in Rhône Department, E. of the Rhône R. and bordering Lyon. An industrial center, it has large plants engaged in metallurgy, dyeing and tanning, food processing, and the manufacture of chemicals and rayon. Pop. (1968) 119,879.

VILLIERS, name of English noble family. One branch was given the title duke of Buckingham (q.v.). Another branch, beginning with the British diplomat Thomas Villiers (1709–86), was given the titles baron Hyde (1756) and earl of Clarendon (1776). The most important members of the family were the following.

George Villiers, 1st Duke of Buckingham (1592–1628), statesman, born in Leicestershire. Coming to court in 1614, he soon became a favorite of James I (q.v.), King of England, and was appointed his private secretary. He was knighted and in 1618 created marquis of Buckingham. In 1623, during his absence in Spain, where he tried to arrange the marriage of Prince Charles, later Charles I (q.v.), King of England, to the Spanish infanta, Buckingham was made a duke and given other honors. His mission failed, however, and he promoted a course of war with Spain. His power continued to increase until he



George Villiers, 1st Duke of Buckingham

became virtual ruler of England in about 1624, a position he retained with the accession of Charles in 1625. Parliament distrusted and resented Buckingham, however, and used his disastrous military expedition to Cádiz while lord high admiral as an excuse to impeach him. To prevent a trial Charles dissolved Parliament. In 1627, while attempting to relieve the Huguenots (q.v.) on the Île de Ré in France, Buckingham suffered another major defeat. The following year at Portsmouth, where he was preparing a second expedition to France, he was assassinated by a naval officer.

George Villiers, 2nd Duke of Buckingham (1628–87), politician, son of the preceding, born in London, raised at court, and educated at the University of Cambridge. He fought with the Royalist army during the Great Rebellion (q.v.) and later served the exiled Charles II (q.v.), King of England, as privy councilor. In 1657, having become estranged from the king, he returned to England and married the daughter of the former parliamentary general Thomas Fairfax, 3rd Baron Fairfax (see under FAIRFAX). Oliver Cromwell (see under CROMWELL), Lord Protector of England, suspected Buckingham of conspiring against his government and sent him to prison. Only the influence of Fairfax saved Buckingham from execution. After the restoration of the monarchy in 1660, Buckingham again served Charles as privy councilor and was regarded as one of his chief advisers. A man of scandalous reputation, he was involved in many intrigues and at the request of Parliament was dismissed from the king's favor in 1674. Buckingham wrote several

comedies, including a popular burlesque, *The Rehearsal* (1671).

See also BUCKINGHAM.

VILLIERS, Alan John (1903–), Australian seaman and writer, born in Melbourne. He began his seafaring career at the age of fifteen and subsequently made voyages throughout the world. In 1957 he was captain of the *Mayflower II*, a replica of the original *Mayflower* (q.v.), on a voyage that recreated the voyage of the original vessel to the New World. Villiers has written many vivid accounts about sailing, including *Sons of Sinbad* (1940), *The Way of a Ship* (1953), and *Captain Cook, the Seaman's Seaman* (1967).

VILLIERS DE L'ISLE-ADAM, Comte Philippe Auguste Mathias de (1838–89), French writer, born in Saint-Brieuc, Brittany. Although born of a noble family, he died in poverty after living a precarious Bohemian life in Paris. He is best known today for his collection of short stories *Contes Cruels* (1883; Eng. trans., *Sardonic Tales*, 1927) and for the drama *Axël* (published in final form in 1890; Eng. trans., 1925). Villiers was one of the principal originators of the symbolist movement in French literature; see SYMBOLISTS. His works, written in the Romantic style, are often concerned with the supernatural and even with horror; they serve chiefly to express his philosophical ideas.

VILLON, François (b. 1431), French lyric poet, born near Paris, and educated at the Sorbonne. His real name is thought to have been either François de Montcorbier or François des Loges. He assumed the name Villon, however, out of gratitude to his patron Guillaume de Villon, a chaplain and professor of canon law, who adopted and befriended him. At the university, Villon, while earning the degree of bachelor of arts (1449) and master of arts (1452), participated fully in the roistering academic life of the time. In 1455 he killed a priest in a street brawl; his sentence, banishment, was shortly afterward rescinded on the ground that he had acted in self-defense. A year later, before leaving for the city of Angers as a result of a severe beating he received in another brawl, Villon participated in the theft of 500 crowns from the chapel of the Collège de Navarre in Paris. When his participation in the theft became known over a year later, he was tried in absentia and again sentenced to banishment.

During the next four years (1456–60) Villon wandered about France, visiting the court of Charles of Orléans (see under ORLÉANS) and possibly also that of John II, Duke of Bourbon (see BOURBON: *The French Bourbons*). In 1461 he was arrested by order of the bishop of Orléans and

imprisoned in the town of Meung. After a few months, however, he and his fellow prisoners were pardoned by Louis XI (q.v.), King of France.

Villon returned to Paris in 1462, but quickly got into serious trouble again. He was charged with theft, arrested, and released for lack of evidence. The same month, however, he was arrested as a result of his presence at a serious fracas and was condemned to death. About a year later, his sentence was commuted to banishment from Paris. Nothing further is known of his life.

Writings. Villon's great merit lies in the subjectivity of his verse. He candidly expressed what he felt, whether good or bad, and his frankness about himself led him to write with equal frankness about others; his poems therefore present a colorful and generally reliable picture of his times. His major writings comprise *Les Lais* ("The Lays", or "The Legacy"), also called *Le Petit Testament* ("The Little Testament"), written perhaps in 1456, and *Le Testament*, also called *Le Grand Testament* ("The Great Testament"), written in 1461-62. Both poems are composed of eight-line stanzas, with eight syllables to a line. The *Grand Testament* also includes a number of ballades and rondeaux; see BALLAD; RONDEAU. Among Villon's minor work are some half-dozen poems written in underworld slang (q.v.).

VILNA or VILNIUS (Pol. *Wilno*; Ger. *Wilna*), city in the Soviet Union, and capital of the Lithuanian S.S.R., on the Neris R., about 57 miles s.e. of Kaunas. The largest city of Lithuania, it is an important railroad junction and industrial center. Among the principal manufactures are lumber, wood and paper products, agricultural tools, electrical equipment, leather goods, woolen textiles, chemicals, fertilizer, glass, tobacco products, and processed foods. Vilna is famed as a cultural center and is the site of many architectural landmarks. Noteworthy are the ruins of the castle of the Lithuanian prince Gedimin (d. about 1340); the cathedral of Saint Stanislas (1801), a structure in the neo-classical style and the fourth of a series dating from 1387; the Ostra Brama (Pointed Gate) Chapel, containing a hallowed 16th-century image of the Black Madonna; the University of Vilnyus (founded in 1579); and the baroque Church of Saint Peter and Saint Paul, dating from the 17th century.

History. The site of the city was settled in the 10th century. In 1323 Prince Gedimin established it as the capital of the principality of Lithuania. Vilna was sacked by the Teutonic Knights

in 1377. After the union (1569) of Lithuania and Poland, the city became a center of Polish culture and Jewish learning, but it was severely damaged by fires, plagues, and Swedish and Russian invaders during the next two centuries. Vilna was incorporated into the Russian Empire following the third partition (1795) of Poland. During World War I the city was invaded and held (1915-18) by German forces. The Poles, the Lithuanians, and the Bolsheviks controlled the city for varying periods after the collapse of Germany. On Aug. 24, 1920, the Soviet Union transferred Vilna to the newly formed independent state of Lithuania. The city, proclaimed the capital shortly thereafter, was seized by Polish troops on Sept. 9. Vilna was formally annexed by Poland subsequent to a Polish-controlled plebiscite (Jan. 8, 1922), which the Lithuanian voters of the city boycotted. The Lithuanian government, refusing to recognize the validity of the vote, severed diplomatic relations with Poland. This state of affairs persisted until March, 1938, when Poland forced Lithuania to renounce its claims to Vilna. In 1939, following the outbreak of World War II, the Soviet Union occupied the city and then transferred it to Lithuania. It was made the capital of the newly created Lithuanian S.S.R. in 1940. During the German occupation from 1941 to 1944 Vilna suffered heavy damage; the large Jewish population was virtually exterminated. See LITHUANIA: History. Pop. (1970) 372,000.

VIMY, town of France, in Pas-de-Calais Department, 10 miles n. of Arras. Vimy is on a strategic limestone ridge, which was the scene of violent fighting during World War I. Vimy was taken, lost, and retaken several times by Canadian forces, and in the process about 11,000 Canadian soldiers were killed. A monument at the ridge, built in 1936, commemorates the Canadian war dead. Pop. (1968) 3272.

VIÑA DEL MAR, city of Chile, in Valparaíso Province, on the Pacific Ocean, at the mouth of the Estero Marga-Marga, 5 miles e. of Valparaíso. The leading resort of the country and one of the major seaside resorts in Latin America, the city is also a manufacturing center. It is a road hub on the coastal railroad in an agricultural area. Industries include sugar refining, vegetable-oil milling, fruit processing, and the manufacture of chemicals, petroleum products, wine, textiles, alcohol, and soap. In the city are luxurious estates, waterfront hotels, parks and gardens, social clubs, a municipal casino and theater, sport facilities (including the racetrack of the famous Valparaíso Sporting Club), and extensive beaches. Nearby to the s.w. is the Santa Maria

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Technical University. The summer residence of the president of Chile is in the city. Originally the Indian settlement of Penco and settled by the Spaniards in 1560, Viña del Mar was long under Jesuit control. The city was laid out in 1874. Pop. (1970 est.) 153,085.

VINCENNES, city in Indiana, and county seat of Knox Co., on the Wabash R., 22 miles n. of Oakland City. The Lincoln Memorial Bridge connects the city with Illinois on the opposite bank of the river. Vincennes is the trading center and distributing and shipping point of a rich agricultural and mineral-producing region. Industrial products in the city include glass, batteries, shoes, steel, paper products, and automobile springs.

The city is the site of Vincennes University, a junior college established in 1806. Vincennes, oldest city in Indiana, contains many historical landmarks, notably the memorial for the American revolutionary George Rogers Clark (see under CLARK), built in 1932, and occupying part of the site of an old fort; the Cathedral Library, the oldest in Indiana; Territorial Hall, built about 1800 and the first capitol of Indiana Territory; and the mansion of William Henry Harrison (q.v.), first governor of Indiana Territory and later President of the United States.

History. The first settlement on the site was made by the Canadian explorer François Marie Bissot, Sieur de Vincennes (1700–36), about 1731. The fort built by Vincennes was captured by the British in 1777 and named Fort Sackville. On Feb. 25, 1779, Fort Sackville was captured by a small force of Americans under George Rogers Clark. From 1800 to 1813 Vincennes was the capital of Indiana Territory. It was incorporated as a city in 1856. Pop. (1960) 18,046; (1970) 19,867.

VINCENNES, town of France, in Val-de-Marne Department, about 5 miles E. of central Paris. Chemicals, rubber goods, and hardwares are manufactured. In the town are immense barracks, a great fortress famous for its arsenal and its school of marksmanship, and depots of military supplies. The château to which the town owes its historical importance is built in the form of a parallelogram. The building was begun by King Louis VII (q.v.) in 1164 and was used as a royal residence until 1740. In 1832 King Louis Philippe (q.v.) fortified it and turned it into a military depot. Henry V, King of England, and Jules Mazarin (qq.v.), the French cardinal and statesman, died in the castle. Among its famous prisoners were the French statesman Comte de Mirabeau, the painter Jean Fouquet, and the philosopher and dramatist Denis Diderot (qq.v.). The Duc d'Enghien (q.v.), last

prince of the famed Condé (q.v.) family, was falsely accused of espionage and executed in a trench nearby in 1804. Pop. (1968) 49,297.

VINCENT, John Heyl (1832–1920), American Methodist Episcopal bishop and founder of the Chautauqua movement in adult education, born in Tuscaloosa, Ala. He entered the New Jersey Conference of his church in 1853 and from there was transferred to the Rock River (Ill.) Conference in 1857. He was pastor of churches in Chicago and established the *Northwestern Sunday School Quarterly* (1865), which was renamed the *Sunday-School Teacher* (1866) and made into a monthly magazine. In 1888 he was elected bishop and in 1900 was appointed resident Methodist bishop in Europe, with his headquarters in Zürich, Switzerland. He retired from the active episcopate in 1904. Vincent was the chief founder of the Chautauqua Institution in 1874 and was responsible for a number of innovations in the methodology of Sunday-school teaching. Among his books are *The Chautauqua Movement* (1886), *A Study in Pedagogy* (1890), and *Family Worship for Every Day in the Year* (1905). See EDUCATION, ADULT.

VINCENT DE PAUL, Saint (1581–1660), French priest, founder of the Congregation of the Mission, called the Vincentians and the Order of the Lazarists, born near Pouy (now Saint-Vincent de Paul), in Gascony. He attended the universities of Dax and of Toulouse.

It is said he was seized by pirates while going from Marseille to Narbonne in 1606; sold into slavery in Tunis, he escaped and returned to France some months later. He spent some twenty years as a parish priest and chaplain to an aristocratic family. He was also chaplain general of the galleys of France and as such tried to aid the galley slaves. In Châtillon-les-Dombes, near Lyon, in 1617 he founded the first Confraternity of Charity, made up of wealthy women working among the sick and poor. In 1622 he was appointed superior of the Parisian convents of the Order of the Visitation of Holy Mary by the French prelate Saint Francis of Sales (q.v.).

With the support of the family whom he served as chaplain, he founded the Congregation of the Mission to preach to the peasants on the family's estates. A community of the congregation was formally established at the Collège des Bons-Enfants in Paris in 1626, where Vincent served as principal. The alternate name Lazarist Fathers was given to the group when it established headquarters at the former priory of Saint Lazare, in Paris, in 1632. Vincent not only headed the order, but with others he founded several charitable organizations, notably the

Daughters of Charity, formed under his direction in 1633. The foundling hospital of Paris owes its origin to this group, introduced into the United States by Saint Elizabeth Ann Seton (q.v.) in 1809. The American branch, officially the Daughters of Charity of Saint Vincent de Paul, is sometimes called the Sisters of Charity. The Congregation of the Mission organized several seminaries for the training of priests as a result of work done by Vincent de Paul with young men about to be ordained. He was also concerned with relief work during the religious wars in France. His opposition to Jansenism is believed to have been responsible for its suppression; see JANSEN, CORNELIS. Vincent de Paul left no writings besides his correspondence and materials concerned with the Congregation of the Mission. He was canonized in 1737 and named patron of works of charity in 1885. His feast day is Sept. 27.

VINCENT'S DISEASE. See TRENCH MOUTH.

VINCI, Leonardo da. See LEONARDO DA VINCI.

VINE, term for a flexible, twining plant that does not support itself upright but thrives naturally by winding along the ground or climbing over a wall, fence, or other plant. Vines are also known as climbing plants or trailing plants. Some woody vines, unlike herbaceous vines, can support themselves. See separate articles on particular vines, for example, BEAN; GRAPE; IVY; WISTERIA.

VINEGAR, sour-tasting condiment and preservative prepared by two successive microbial processes, the first being an alcoholic fermentation effected by yeasts and the second an oxidation (q.v.) of alcohol by *Acetobacter*, a genus of aerobic bacteria (q.v.); see ALCOHOL; FERMENTATION.

Regulations of the United States Food and Drug Administration prescribe that the unmodified name "vinegar" apply only to the product derived from apples and that it contain not less than 4 g of acetic acid (q.v.) in 100 milliliters of vinegar. Vinegar also contains small quantities of ash, sugars, phosphoric acid, alcohol, and glycerol. A quick method of manufacturing vinegar is to pour fermented apple cider containing about 10 percent alcohol over wood shavings while air is blown through the mixture. The resulting liquid is then clarified and filtered before use. In Great Britain, vinegar made from malt (q.v.) is preferred, and in continental Europe, vinegar prepared from white wine is favored. Other varieties of vinegar are produced from beetroot, tarragon, and alcoholic spirits.

VINEGAR EEL, tiny, threadlike roundworm, *Turbatrix aceti*, which is free-living, about $\frac{1}{16}$ in.

in length, and feeds on acetic acid bacteria. Its name results from its frequent presence in cider vinegar and in other substances involved in fermentation (q.v.). It must be observed through a microscope to be clearly seen and is not harmful if eaten. See also NEMATODES.

VINELAND, city of New Jersey, in Cumberland Co., between the Maurice and Manumuskin rivers, 35 miles s. of Camden. A market center in an area raising poultry, vegetables, and fruit, the city includes among its industries vegetable and fruit processing, bottling, and the manufacture of glassware, apparel, building materials, and paper products, chemicals, wine, rugs, and feed. It is the site of institutions, including the Home for Disabled Soldiers, Sailors, and Marines and the Vineland Training School (1888), noted for its research work. Landis township was founded in 1861 and organized in 1864, and Vineland borough was created in 1880. In 1952 the borough and township were combined to form the city. Pop. (1960) 37,685; (1970) 47,399.

VINH, city in N. Vietnam, capital of Nghean Province, on a fertile coastal plain near the mouth of the Song Ca R., 160 miles s. of Hanoi. A trade center on the coastal railroad, it lies in an area growing rice, corn, timber, and livestock; iron and manganese deposits are in the vicinity. Connected with the port of Ben Thuy, 2 miles s.e. on the South China Sea, Vinh has railroad repair shops, a fish cannery, a sawmill (1960), and a power plant (1961). In 1964 U.S. fighter planes struck targets near Vinh in an action related to the Tonkin Gulf incident. See VIETNAM, WAR IN. Pop. (1970) 47,399.

VINLAND or WINELAND, name given to that part of North America first seen in 986 by Bjarni Herjolsson, who was driven there by a storm while making a voyage from Iceland to Greenland. The land was not explored and named until 1000, when it was visited by the Norwegian navigator Leif Ericson (q.v.), who sailed southward along the coasts of Labrador and Newfoundland and gave the name of Wineland to one portion of the country because of the number of grapes he found growing there. Carl Christian Rafn (1795–1864), the Danish philologist and antiquary, in his *Antiquitates Americanae* (1837), sets forth such evidence as exists respecting colonization in America by the Norsemen (q.v.). To this work may be traced the extended popular belief in the statements that the Old Mill at Newport, the Dighton Rock, and other remains can be ascribed to Viking settlements. Excavations of an early settlement at L'Anse-au-Meadow, in northern Newfoundland, correspond to Ericson's descriptions of Vinland.

VINNITSA

VINNITSA, city of the Soviet Union, in the Ukrainian S.S.R., and administrative center of Vinnitsa Oblast, on the Bug R., about 125 miles s.w. of Kiev. An important railroad junction, Vinnitsa also has food-processing centers. The city was established in the 14th century. Pop. (1970) 211,000.

VINSON, Frederick Moore (1890–1953), American political leader and jurist, born in Louisa, Ky., and educated at Kentucky Normal College and in law at Centre College of Kentucky. He served as a Democrat from Kentucky in the United States House of Representatives (1924–29 and 1931–38), where he was noted as a fiscal expert and supporter of labor. From 1938 to 1943 he was associate justice of the United States Court of Appeals for the District of Columbia. In 1943, during World War II, President Franklin Delano Roosevelt (q.v.) appointed him director of the Office of Economic Stabilization. Leaving this office in 1945, Vinson was successively Federal loan administrator (March), director of the Office of War Mobilization and Reconversion (April–July), and secretary of the treasury (July, 1945–June, 1946). On June 24, 1946, he was appointed Chief Justice of the United States. In this post he generally upheld legislation that supported the Fair Deal policies of President Harry S. Truman (q.v.), an extension of the New Deal (q.v.) policies of President Roosevelt.

VIOL, musical string instrument played with a bow, popular mostly in the 16th and 17th centuries. The back is flat; the shoulders slope more than those of its successor, the violin (q.v.); and frets, like those of the guitar (q.v.), are placed on the neck of the instrument to show where the fingers of the left hand should be put to produce the desired notes. There is great variety in the number of strings, which are tuned by fourths and thirds, and in the types of bows employed. There are four sizes of viol, treble or discant, tenor or viola da braccio, bass or viola de gamba, and double bass or violone; see also VIOLA. A chest of viols is a set of these instruments, usually comprising six: two trebles, two tenors, and two basses. Viols are usually played resting on or between the knees of the player, rather than held beneath the chin. The viols eventually gave way to the instruments of the violin family, to which, however, they bear little resemblance in sound.

VIOLA, musical instrument, the tenor violin, in size and compass midway between the violin and the violoncello (qq.v.). It has four gut strings, the lower two covered with silvered copper wire, which are tuned a fifth (see INTERVAL) below those of the violin. The viola evolved

most directly from the viol (q.v.) known as the viola de braccio, or arm viol, but its tone is richer, deeper, and stronger. The viola d'amore is a stringed instrument that was popular during the early 18th century. It has from five to seven strings of catgut, and below them, passing under the bridge, an equal number of wire strings, which vibrate sympathetically with them. See MUSICAL INSTRUMENTS: *Stringed Instruments*.

VIOLET, genus of herbaceous plants, mostly perennial, in the Violet family (Violaceae). They have a short stem, or are stemless, having in the latter case a short rhizome; the leaves are alternate, and have long stalks; the flowers have five petals, different in form and size, the lowest having a spur behind. Several species are much cultivated in gardens; some of these, for example *V. tricolor*, on account of their beautiful flowers; others, for example, *V. odorata*, on account of their fragrance. *V. tricolor*, or pansy, is a very variable plant; its flowers differ in size and color. The common name for the wild pansy is heartsease. North America has many native species, white and yellow, as well as blue-flowered. One of the most common blue-flowered species is *V. papilionacea*; *V. sororia* is similar, but has densely woolly leaves. The species *V. pubescens* has yellow flowers, and *V. canadensis* and *V. sagittata* have white flowers. The dog-tooth violet, *Erythronium americanum*, is not related to this genus, but is in the Lily family (Liliaceae).

Yellow violet, *Violet rotundifolia*

Jeanne White - National Audubon Society



French violinist Zino
Francescatti
Columbia Records



VIOLIN, musical instrument, primarily wooden and with four strings stretching its entire length, which is supported against the musician's shoulder and played by drawing a bow across the strings and sometimes also by plucking the strings; the soprano member of the modern bowed stringed-instrument family.

Structure. The violin has about seventy different parts, each of which must be perfectly fitted so that the entire instrument can vibrate as a single unit. The body of the violin consists of an upper surface called a soundboard or table; side walls, or ribs; and a back. A narrow fingerboard extends outward from the upper portion of the soundboard and ends in a pegbox and scroll. A string holder, or tailpiece, is attached to the lower portion of the soundboard. Four strings are tied to holes in the tailpiece, then stretched over a bridge in the middle of the soundboard and tied near the end of the fingerboard to pegs. The pegs are turned to tune the strings. Several pieces of wood are glued to the inside of the body to spread vibrations evenly over the soundboard and to increase resonance. One of these is a bass bar, a thin strip of wood about $4\frac{1}{2}$ in. long; it is attached along the undersurface of the soundboard. Another piece of wood, called the sound post, is held upright between the back and the soundboard near the middle of the body. F-shaped holes are cut into the soundboard on either side of the bridge to allow resonated sound to escape from inside the body. The bow, which is the piece used to play the violin, is a long wooden stick with numerous strands of horsehair strung from end to end and heavily treated with rosin (q.v.).

History. Instruments played with a bow seem to have originated in Asia about the 8th or 9th century. From there they spread to Europe. Among the European forerunners of the modern violin are the 13th-century *vielle* and the 16th-century *klein geigen* (Ger., "little fiddle"). The

vielle had the shape of a flattened pear; it was held in the same manner as a modern violin, that is, with the instrument held by one hand at the shoulder and the bow held in the other palm-downward. The *klein geigen* had only three strings, but they were tuned as in a modern violin with the pitch of each string separated from the others by the interval (q.v.) of a fifth.

The first violin makers were Italians working in Brescia and Cremona. By the 17th century, Cremona was the leading center of violin making. Three families in that city made instruments that have never been surpassed for beauty, tone quality, and craftsmanship. The most famous members of these families were Nicolò Amati (see under AMATI), Giuseppe Guarneri, and Antonio Stradivari (qq.v.).

Next to the human voice, the violin is one of man's most intimate, flexible, and expressive instruments. The range of a violin extends over four octaves (see OCTAVE), the lowest tone being the G below middle C on the piano. The strings may be bowed or plucked, and a device known as a mute can be inserted on the bridge over the strings to dampen vibrations and produce a muffled tone. Different pressures applied to the bow and different speeds used in drawing it over the strings affect the volume and tone quality in subtle ways. By drawing the bow over the strings close to the bridge, a hard metallic tone results. The upper range of the instrument can be extended through the use of harmonics (q.v.), high, thin-sounding tones produced by touching the strings lightly with the fingers of the left hand so that the strings vibrate in halves or thirds rather than as a whole. In addition to single tones, chords, or double-stops, can be played.

Eminent Soloists. The violin was used for virtuoso display from early times. In the 18th century, the Italian Giuseppe Tartini and in the

VIOLLET-LE-DUC

19th century, the Italian Nicolò Paganini and the Spanish Pablo de Sarasate y Navascués played their own compositions with special embellishments known only to themselves. By the 20th century virtuoso violinists usually refrained from adding to the compositions they played, either alone or accompanied. Particularly noted violinists were trained in Eastern Europe and Russia in the last years of the 19th century and the early 20th century. Some of these left to settle in America or in Western Europe; among these were the Russians Jascha Heifetz, Nathan Milstein (1904–), and Mischa Elman (1891–1967), the Hungarian Joseph Szigeti (1892–1973), and the Austrian Fritz Kreisler. Russian-born Isaac Stern came to the United States as an infant, and Yehudi Menuhin was born in the U.S. After World War II, Soviet violinists David Feodorovich Oistrakh (1908–74) and his son Igor Oistrakh (1931–) began to tour in the West. Many notable violinists have, by choice, been chamber or orchestral musicians, but, among others, the Brazilian Jaime Laredo (1941–), the French Zino Francescatti (1902–), the American Ruggiero Ricci (1920–), and the Israeli Pinchas Zukerman (1948–) more often appear as soloists on the concert stage. For violinists whose names are not followed by life dates, see separate articles. J.V.

VIOLLET-LE-DUC, Eugène Emmanuel (1814–79), French architect and writer, born in Paris, and educated at the Collège Bourbon. He was especially skilled in the restoration of works of medieval architecture, although many modern experts have denounced his work as more fanciful than authentic. He designed and supervised the restorations of the walled city of Carcassonne, the château of Pierrefonds, the church of

Vézelay, and the cathedrals of Laon, Amiens, and Notre-Dame in Paris.

His prolific writings include several major works, for instance, *Dictionnaire Raisoné de l'Architecture Française du XI au XVI Siècle* ("Dictionary of French Architecture from the 11th to the 16th Century", 10 vol., 1854–69); *Dictionnaire Raisoné du Mobilier Français de l'Époque Carlovingienne à la Renaissance* ("Dictionary of French House Furniture from the Carolingian Epoch to the Renaissance", 6 vol., 1855–75); and *Histoire d'un Hôtel de Ville et d'une Cathédrale* ("History of a Town Hall and a Cathedral", 4 vol., 1873–78).

VIOLONCELLO, or **CELLO**, large musical instrument of the violin class, held by the performer between his knees. It has four strings tuned to the pitches C, G, D, and A. Its compass extends over more than four octaves. In its present form the instrument dates from the latter half of the 16th century. Until the late 18th century the cello was used primarily as a supporting instrument, playing bass lines and adding fullness to the inner spaces of musical textures. Unaccompanied cello suites were composed (1720?) by the German composer Johann Sebastian Bach (q.v.). Composers in the 19th century placed great value on the richness and flexibility of the instrument and wrote many solo parts for it in their orchestral works. More recent composers have further explored the solo capabilities of the instrument. The most prominent of these composers was the Spanish-born Pablo Casals (q.v.), who was also famous as a soloist, conductor, and teacher. Other leading soloists are the Americans Jacqueline Du Pré (1945–) and Leonard Rose (1918–), and the Soviet Mstislav Rostropovitch (1927–). J.V.

VIPER, name for venomous snakes of the family Viperidae. The family includes many impor-

Gaboon viper, Bitis gabonica New York Zoological Society



tant forms, for example, the common viper, *Vipera berus*, extending as far north as Sweden; the African horned viper, *Bitis nasicornis*; the Gaboon viper, *B. gabonica*; the puff adder, *B. arietans*; the Indian Daboia or Russell's viper, *V. russelli*; and the Indian viper, *Echis carinatus*; the family does not include the pit viper (q.v.). The head of the viper is relatively broad, somewhat triangular, and generally covered with scales; the eye has a vertical pupil, and there is no pit between it and the nostril, as in the pit vipers. The maxilla bears on each side one functional fang, usually with several reserve fangs beside it; the venom is virulent. The vipers are widely distributed through Europe, Asia, and Africa; the majority of the species are African. Most vipers produce living young.

VIPSANIA AGRIPPINA. See AGRIPPINA.

VIRCHOW, Rudolf (1821–1902), German pathologist, archeologist, and anthropologist, born in Schivelbein, Pomerania, (now Świdwin, Poland), and educated at the University of Berlin. In 1843 he became prosector at the Charité Hospital in Berlin, and in 1847 a university lecturer. In 1849 he was invited to the medical school of Würzburg as professor of pathological anatomy, having been dismissed from his Berlin posts because of revolutionary activities. In 1856 he returned to Berlin as professor and director of the pathological institute.

Virchow was the first to demonstrate the relationship between cells and disease and is best known for his text *Cellular Pathology as Based on Histology* (1850; Eng. trans., 1860). He engaged also in extensive research in the fields of archeology and anthropology, producing numerous writings, among them *Crania Ethnica Americana* (1892). Other publications include discussions of topical political and social questions. Virchow was influential in German politics and from 1880 to 1893 served as a Liberal in the German Reichstag, where he opposed the policies of the German chancellor Prince Otto Eduard Leopold von Bismarck (q.v.). He was instrumental in the establishment of the Pathological Institute and Museum in Berlin.

VIREO, or GREENLET, common name applied to oscine birds belonging to the family Vireonidae. The family comprises about forty species; twelve are found in the United States, and the rest are native to tropical America. Vireos are small birds with head, wings, back, and tail ranging in color from olive green to grayish yellow, and with breast and abdomen predominantly white. The bill is slightly hooked at the tip. The birds are largely arboreal in habit. They subsist on insect larvae, which they find under

dead leaves and in the crevices of tree bark. Vireos build small, deep, cup-shaped nests of bits of bark, grasses, weeds, mosses, roots, and other soft materials, suspending them in the forks of tree branches. The nests are built about 4 to 50 ft. above the ground, and are usually set well away from the main trunk of the tree. Vireos lay from three to five white or cream-colored eggs in a clutch; the eggs have clearly defined reddish and brownish markings. The red-eyed vireo, *Vireo olivaceus*, the white-eyed vireo, *V. griseus*, the yellow-throated vireo, *V. flavifrons*, and the warbling vireo, *V. gilvus*, are four of the species commonly found in the U.S.

VIRGIL. See VERGIL.

VIRGILIA. See YELLOWWOOD, AMERICAN.

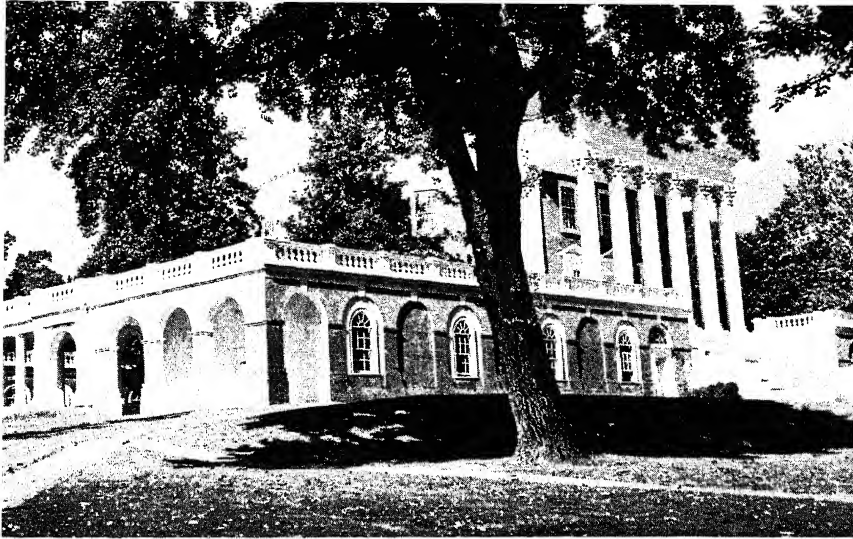
VIRGINAL, keyboard musical instrument of the 16th and 17th centuries, one of the precursors of the piano (q.v.). It looks like a small piano without legs, is light enough to be carried, and is set on a table or chest. The case is usually elaborately ornamented. The range of the instrument is four octaves. It has a quill and a jack like those of the spinet and harpsichord (qq.v.), to which it is closely related, and a single string to each note.

VIRGINIA, one of the South Atlantic States of the United States, bounded on the N. and N.W. by West Virginia, on the N.E. by the Potomac R., on the E. by the Atlantic Ocean, on the S. by North Carolina and Tennessee, and on the W. by Kentucky. A small portion of Virginia is separated from the remainder of the State by Chesapeake Bay and occupies the S. tip of the peninsula on which both Maryland and Delaware are also located. Virginia is roughly triangular in shape, measuring about 425 mi. from E. to W. and 200 mi. from N. to S.

Area (36th State in rank)	40,817 sq. mi.
Land	39,780 sq. mi.
Inland water	1037 sq. mi.
Population	(1970, 14th in rank) 4,648,494
	(1960, 14th in rank) 3,966,949
	(1950) 3,318,680
Altitude	sea level to 5729 ft.
Capital	Richmond (1970) 249,621
Largest city	Norfolk (1970) 307,951
Entered Union (10th State)	June 25, 1788
Nickname	The Old Dominion
Motto	<i>Sic Semper Tyrannis</i> (Thus Ever to Tyrants)
Song	"Carry Me Back to Old Virginia"
Flower	dogwood
Bird	cardinal

THE LAND

Virginia is divided into three topographical regions: the coastal plain or Tidewater region, the Piedmont Plateau, and the Appalachian Mts. (q.v.). The coastal plain, the easternmost region, comprises the area between the Atlantic Ocean and the Piedmont Plateau. It is more than 100 mi. wide and includes approximately 11,000



The University of Virginia, at Charlottesville. Designed by President Thomas Jefferson, the campus is among the many famous landmarks of the State. Virginia State Chamber of Commerce

sq.mi., or about one fourth of the total area of the State. It is a low-lying, level area, gradually increasing in elevation from sea level to a few hundred feet at its w. edge. Parts of the plain are marshy. In the s.e. corner of the State is the Great Dismal Swamp (see DISMAL SWAMP). Although the general coastline of Virginia is only 112 mi., the overall coastline, measured around tidal bays, inlets, and estuaries, is 3206 mi. The Piedmont Plateau extends to and along the s.e. base of the Appalachian Mts. Its width increases from about 40 mi. in the n. along the Potomac R. to nearly 175 mi. along the North Carolina boundary. The surface of the plateau is broadly undulating; it slopes from an altitude of 1000 ft. at the w. edge to nearly sea level on the e. The third topographical province, the Appalachian Mts., is sometimes subdivided into the Blue Ridge Mts. and Allegheny Mts. (qq.v.) and the Great Valley. The Blue Ridge, from 3 to 20 mi. wide, traverses the State in a s.w. direction. The highest point in the Blue Ridge and in Virginia is Mt. Rogers (5729 ft.). The average elevation of the State is 950 ft. The Great Valley, which is from 25 to 30 mi. in width, separates the Blue Ridge and the Allegheny ranges and extends diagonally across the State. It is subdivided by five separate valleys through which flow the rivers that drain the area. The elevation of the Allegheny range to the w. of the Great Valley varies between 1500 and 4000 ft.

Rivers. The drainage of the greater part of the State is directly into the Atlantic Ocean or its arm, Chesapeake Bay, through the Potomac, Rappahannock, York, and James rivers and their tributaries; and the Roanoke R., which reaches the Atlantic in North Carolina. These streams flow across the Piedmont Plateau and coastal plain provinces in parallel southeastward courses. The Blue Ridge range forms the princi-

pal watershed in the State. The New R. and the North Fork of the Holston R. in the s. portion of the Great Valley flow s.w. into Tennessee.

Climate. Summers are warm and humid in Virginia, except for the cooler mountain region, and winters are mild. The highest temperature recorded in the State was 110° F. (at Balcony Falls); the lowest, -29° F. (at Monterey). Precipitation is variable, ranging from 36 to 50 in. annually, with the greater amounts in the s.e. and south-central parts of the State. Snowfall averages from less than 10 in. near the coast to 30 in. in parts of the w. highlands, but rarely stays on the ground longer than a few days. The average annual number of days with measurable precipitation ranges from 115 at Richmond and 116 at Norfolk to 121 at Roanoke and 122 at Lynchburg. Severe thunderstorms, sometimes accompanied by strong wind or hail, are relatively frequent. Tornadoes and tropical storms average about one a year.

Climate	Norfolk	Richmond	Roanoke
Normal temperatures (in ° F.)			
January maximum	48.8	47.4	45.6
January minimum	32.2	27.6	27.2
July maximum	86.6	88.2	85.9
July minimum	69.9	67.5	64.4
Annual	59.3	57.8	55.9
Normal precipitation (in inches)			
Wettest month	5.92	5.63	4.15
Driest month	2.71	2.77	2.48
Annual	44.68	42.59	39.03
Latest frost	March 18	April 2	April 20
Earliest frost	Nov. 27	Nov. 8	Oct. 24
Mean number of days between latest and earliest frosts	254	220	187

Plants and Animals. In the coastal plain of Virginia the principal trees are pines and, along the streams, birches. Other plants indigenous to this region include holly, alder, wisteria, trumpet vine, myrtle, cranberry, wild yam, and wild rice. In the limestone valleys hemlock, hawthorn, ar-

INDEX TO MAP OF VIRGINIA

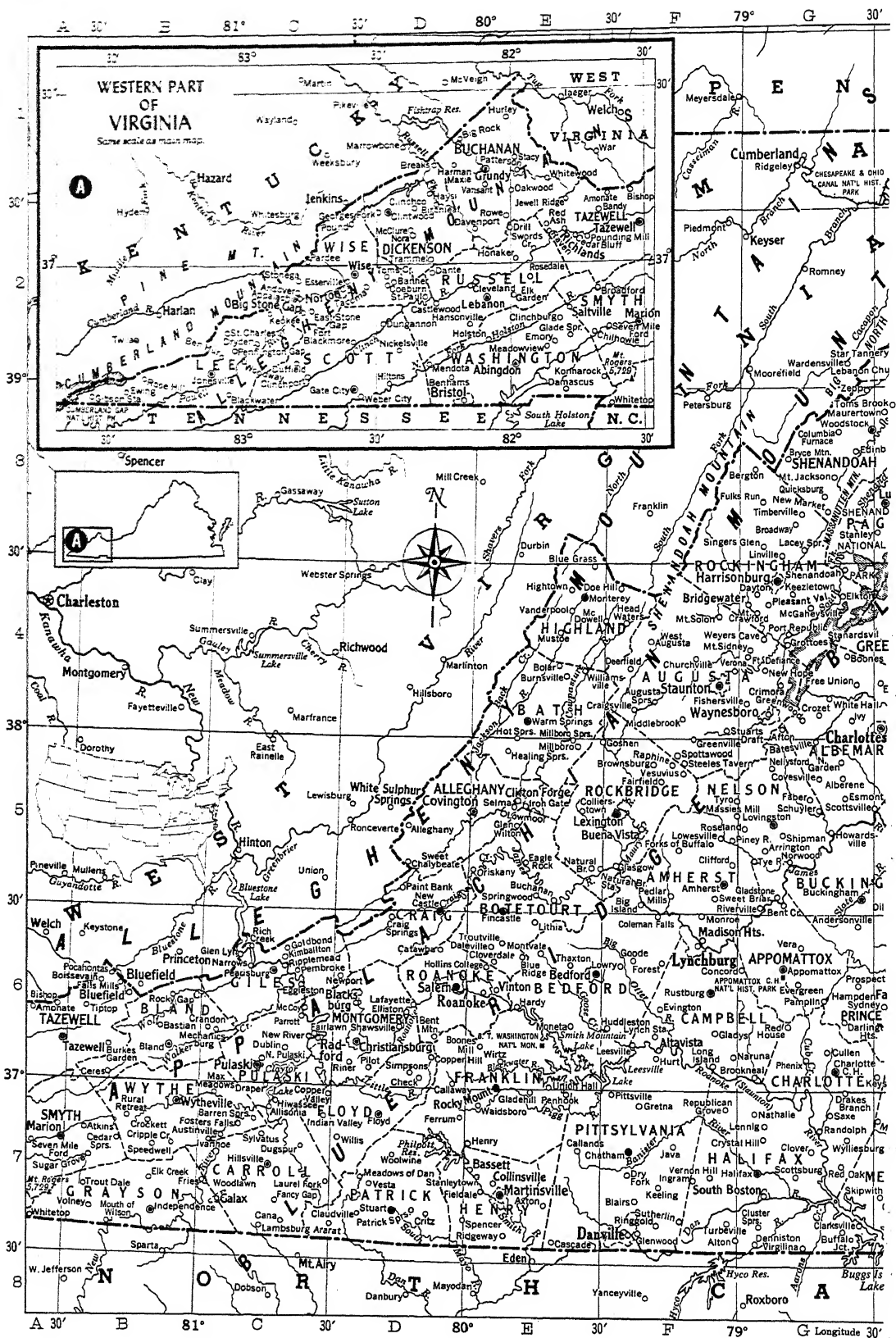
Cities and Towns

Abingdon ○	E 2	Callao	L 5	Drewryville	K 7	Harman-Maxie	D 1
Accomac ○	N 5	Calverton	J 3	Drill	E 2	Harrisonburg ○	F 4
Achilles	M 6	Cape Charles	M 6	Dryden	C 2	Hartfield	M 5
Afton	G 4	Capeville	M 6	Dublin	C 6	Haymarket	J 3
Alberene	G 5	Capron	K 7	Dumfries	K 3	Haynesville	L 5
Alberta	J 7	Cardwell	J 5	Dundas	H 7	Haystack	D 1
Alexandria	L 3	Carrsville	L 7	Dungannon	D 2	Head Waters	F 4
Allisonia	C 7	Carson	K 6	Dunnsville	L 5	Heathsville ○	L 5
Altavista	F 6	Casanova	J 3	Eagle Rock	E 5	Henry	E 7
Alton	F 7	Cascade	E 7	Earlsville	H 4	Hemdon	K 3
Amelia Court		Castlewood	D 2	East Stone Gap	C 2	Highland Springs	K 5
House ○	J 6	Cattlett	J 3	Eastville ○	M 6	Hillsville ○	C 7
Amherst	F 5	Cedar Bluff	E 2	Ebony	J 7	Hiltons	D 2
Amonate	E 1	Cedar Springs	B 7	Edgehill	K 4	Hiwassee	C 7
Andover	C 2	Center Cross	L 5	Edinburg	H 3	Hoadly	K 3
Annandale	K 3	Chantilly	K 3	Eggleston	C 6	Hollins College	D 6
Appalachia	C 2	Charles City ○	K 6	Elkton	G 4	Honaker	E 2
Appomattox ○	G 6	Charlotte Court		Elliston	D 6	Hopeton	N 5
Ararat	C 7	House ○	G 6	Emory	E 2	Hopewell	K 6
Arlington ○	L 3	Charlottesville ○	G 4	Emporia ○	J 7	Hopkins	N 5
Arrington	G 5	Chatham ○	F 7	Esmont	G 5	Hoptown	O 5
Arvonla	H 5	Cheriton	M 6	Esserville	C 2	Hot Springs	E 4
Ashburn	K 2	Chesapeake	M 7	Ettrick	K 6	Huddleston	F 6
Ashland	J 5	Chester	K 6	Evergreen	G 6	Hume	J 3
Atkins	B 7	Chesterfield ○	J 6	Ewing	B 3	Hurley	E 1
Augusta Springs	F 4	Chester Gap	H 3	Exmore	N 5	Hurt	F 6
Austinville	B 7	Chilhowie	F 2	Fairfax ○	K 3	Independence ○	B 7
Axton	E 7	Chincoteague	O 5	Fairfield	F 5	Iron Gate	E 5
Aylett	K 5	Christiansburg ○	D 6	Fairlawn	C 6	Irvington	M 5
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Banner	D 2	Church View	L 5	Falls Mills	B 6	Ivanhoe	C 7
Barboursville	H 4	Churchville	F 4	Falmouth	K 4	Ivor	L 7
Bassett	E 7	Cismont	H 4	Farmville ○	H 6	Ivy	G 4
Bastian	B 6	Claremont	L 6	Ferrum	D 7	Jamestown	L 6
Batesville	G 5	Clarksville	G 7	Fieldale	D 7	Jamessville	N 5
Bedford ○	E 6	Clay Bank	L 6	Fincastle ○	E 6	Jarratt	K 7
Bellbluff	J 6	Cleveland	E 2	Fishersville	F 4	Jeffersonton	J 3
Belle Haven	N 5	Clifton Forge	E 5	Flint Hill	H 3	Jetersville	H 6
Bellevue	K 3	Clinchburg	E 2	Floyd ○	D 7	Jewell Ridge	E 1
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Bentonville	H 3	Clinchport	C 2	Fork Union	H 5	Keeling	F 7
Berryville ○	H 2	Clintwood ○	D 2	Fork Blackmore	C 2	Keezletown	G 4
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Big Stone Gap	C 2	Cluster Springs	G 7	Fredericksburg	J 4	Keokee	C 2
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Bishop	A 6	Coleman Falls	F 6	Gainesville	J 3	Kilmarnock	M 5
Blacksburg	D 6	Coles Point	L 4	Galax	C 7	King and Queen Court	
Blackstone	H 6	Collinsville	E 7	Garrisonville	J 4	House ○	L 5
Blackwater	C 3	Colonial Beach	L 4	Gate City ○	C 3	King George ○	K 4
Blairs	F 7	Colonial Heights	K 6	Georges Fork	C 2	King William ○	K 5
Bland ○	B 6	Concord	F 6	Gibson Station	B 3	Kinsale	L 4
Bloxom	N 5	Copper Valley	C 7	Glade Spring	E 2	Konnarock	E 2
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Boydton ○	H 7	Cross Junction	H 2	Goldvein	J 4	Lebanon ○	E 2
Boykins	K 7	Crozet	G 4	Goochland ○	J 5	Leesburg ○	J 2
Brandy Station	J 4	Crozier	J 5	Goode	F 6	Lexington ○	E 5
Breaks	D 1	Crystal Hill	G 7	Gordonsville	H 4	Linden	H 3
Bremo Bluff	H 5	Culpeper ○	H 4	Grafton	L 6	Linville	G 3
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Brightwood	H 4	Dahlgren	K 4	Greenbush	N 5	Littleton	K 7
Bristol	D 3	Dale City	K 3	Greenville	F 5	Lively	L 5
Broadford	F 2	Daleville	E 6	Greenwood	G 4	Loretto	K 4
Broadway	G 3	Damascus	E 2	Gretna	F 7	Louisa ○	H 4
Brodnax	J 7	Dante	D 2	Grottoes	G 4	Lovington ○	G 5
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Brookneal	G 6	Davenport	D 2	Grundy ○	E 1	Lowmoor	E 5
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		Drakes Branch	G 7	Hanover ○	K 5	Manakin-Sabot	J 5
		Draper	C 7	Hardy	E 6	Manassas ○	K 3
						Manassas Park	K 3
						Manquin	K 5

○ County seat.

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West of H Greenwich 78° J 30' K 77° L 30' M 76° N 30' O

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 Mount Jackson.....G 3
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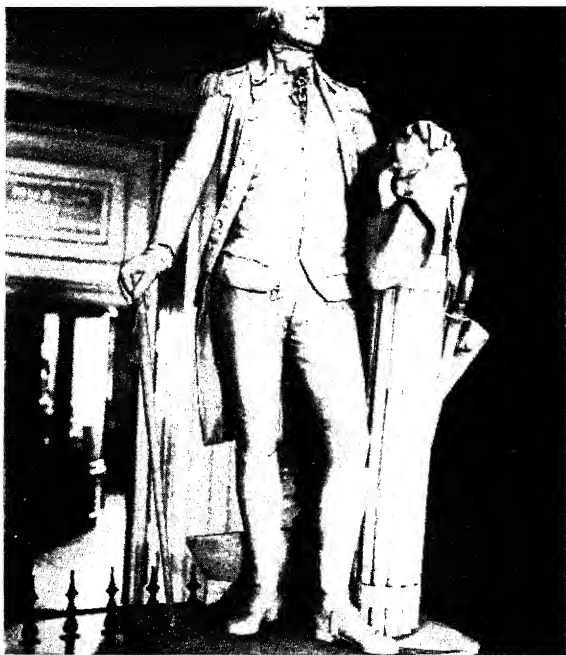
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 Tangier (isl.).....M 5
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 York (riv.).....L 6

borvitae, and many wild flowers are found. In the Dismal Swamp and other swampy areas, bald cypress and sweet and black gum trees grow. The trees of the Piedmont Plateau are principally hardwoods, with oak predominating. Pine, hemlock, wild cherry, and poplar, as well as flowering shrubs such as mountain laurel, rhododendron, and azalea, are indigenous to the w. mountains. In the s.w. groves of walnut, hickory, and chestnut are found. Most of the reforested lands in the State are planted to pine and white oak. Among large animals are the white-tailed deer, distributed generally, and the black bear in the mountains and the Dismal Swamp. Smaller animals include the wildcat, opossum, raccoon, gray squirrel, muskrat, eastern cottontail rabbit, striped skunk, and gray and red foxes. The principal game birds are the bobwhite quail, ruffed grouse, wild turkey, and ducks and geese. Songbirds, including the cardinal, are plentiful. Freshwater fish found in Virginia include perch, pike, bream, catfish, and carp. Landlocked striped bass are found in major artificial impoundments. The shad, sea trout, sea bass, herring, menhaden, and butterfish are important saltwater species. Chesapeake Bay is famous for its abundance of oysters, clams, scallops, and other seafood.

Parks, Forests, and Other Places of Interest.

Virginia has many national parks, monuments, and memorials, most of them commemorating historic events. Shenandoah National Park (q.v.), in the N., contains an outstanding portion of the Blue Ridge Mts., and the Skyline Drive. Reminders of the Civil War are Appomattox Court House National Historical Park (q.v.), Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park and National Cemetery, Manassas National Battlefield Park, Petersburg National Battlefield, Poplar Grove National Cemetery, and Richmond National Battlefield Park. Colonial National Historical Park (q.v.) includes most of Jamestown (q.v.), site of the first permanent English settlement in America, as well as Yorktown, scene of the culminating battle of the American Revolution. Cumberland Gap National Historical Park (partly in Kentucky and Tennessee) contains a mountain pass of the Wilderness Road, explored by the American pioneer Daniel Boone (q.v.). The George Washington Birthplace National Monument (q.v.), on the s. shore of the Potomac R., has a memorial mansion and gardens. Arlington House, The Robert E. Lee Memorial is in Arlington National Cemetery (qq.v.). The Booker T. Washington National Monument, in s.w. Virginia, is the site of the birthplace and childhood



Statue of President George Washington in the Virginia State Capitol at Richmond, sculpted from life measurements by the 18th century French sculptor Jean Antoine Houdon.

Richmond Chamber of Commerce

home of the Negro educator. The two national forests, comprising 1,500,000 acres, are, with headquarters cities in parentheses, George Washington (Harrisonburg) and Jefferson (Roanoke). Assateague Island National Seashore (q.v.) is a 35-mi. barrier island. The Blue Ridge and George Washington Memorial national parkways run through the State.

Among the famous national shrines in Virginia are Arlington National Cemetery, which contains the Tomb of the Unknowns (see UNKNOWN SOLDIER); Mount Vernon (q.v.), the home of George Washington (q.v.), the first President of the U.S., Monticello, the home of Thomas Jefferson (q.v.), third President of the U.S.; and the home of James Monroe (q.v.), fifth President of the U.S. A large part of Williamsburg (q.v.) has been restored to its colonial state.

Natural wonders of the State include the Natural Bridge (q.v.) in Rockbridge County; Luray Caverns, in Page County; and Endless Caverns, in Shenandoah County.

Sports. Virginia offers much to the sport fisherman, with hundreds of miles of coastline and many rivers. Brown, brook, and rainbow trout are stocked. Other freshwater species are five varieties of bass, pickerel, walleye, crappie, bluegill, and sunfish. Chesapeake Bay fishing yields shad, striped bass, and an occasional tarpon. Other saltwater species are blue and white marlin, bluefin and yellowfin tuna, dolphin,

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Natural Bridge, in Rockbridge County, near Lexington, one of the natural wonders of the U.S.

Virginia Dept. of
Conservation & Development

bluefish, mackerel, tautog, spadefish, and flounder. Game animals and birds hunted are white-tailed deer, black bear, cottontail rabbit, gray and fox squirrels, wild turkey, ruffed grouse, and bobwhite quail. Virginia is one of the few Southern States offering winter sports. Snow may average 2 ft. in depth near Hot Springs, where the Homestead ski area operates from December to March. The Blue Ridge Mts. have many peaks accessible to climbers, among them Old Rag Mt. (3291 ft.), with two trails to the summit, one quite difficult and the other relatively easy.

THE PEOPLE

According to the 1970 decennial census, the population of Virginia was 4,648,494, an increase of 17.2 percent over the 1960 population. The urban segment comprised 2,931,154 persons, 63.1 percent of the total, compared with 55.6 percent in 1960. The rural segment comprised 1,717,340 persons (36.9 percent of the total), compared with 44.4 percent in 1960. Ethnically,

the 1970 population was distributed as follows: white persons, 3,761,514; nonwhites, 886,980, including 861,368 Negroes, 7496 Filipinos, 4853 Indians, 3500 Japanese, 2805 Chinese, and others. The percentage of native-born residents was 98.4; of foreign-born, 1.6. The 1970 population density averaged 116.9 per sq.mi., compared with 99.6 in 1960.

The chief cities are Richmond, the capital and second-largest city, a port on the James R., the cultural, commercial, and manufacturing center of the State; and, in order of population, Norfolk, a port on Hampton Roads and a shipbuilding center; Virginia Beach, a residential and resort city; Newport News and Hampton, ports on Hampton Roads and shipbuilding and manufacturing centers; Portsmouth, also a Hampton Roads port and a railroad and manufacturing center; Alexandria, a port on the Potomac R., a rail and manufacturing center, and a residential suburb of Washington, D.C.; and Roanoke, an industrial center.

Education. The public-school system in Virginia was established in 1867. Education in the State is compulsory for all children between the ages of seven and sixteen.

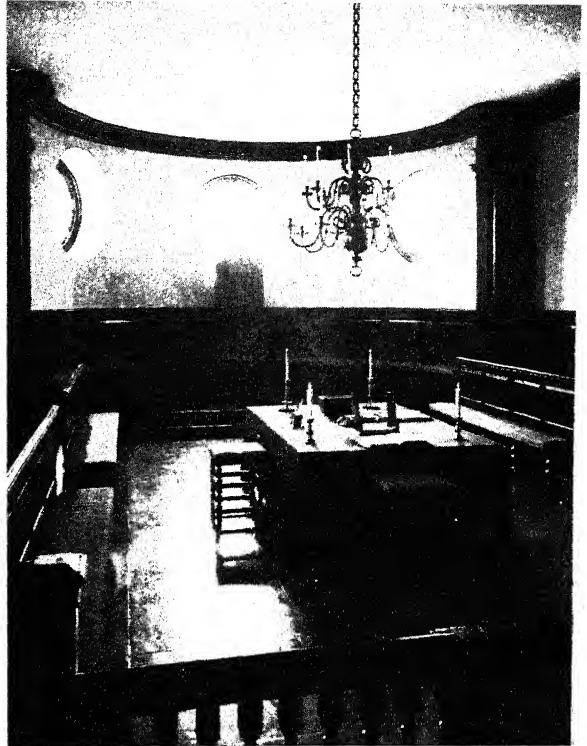
ELEMENTARY AND SECONDARY SCHOOLS. In the early 1970's public elementary schools numbered about 1320 and public secondary schools, about 445. Enrollment was about 765,000 in elementary and about 309,000 in secondary schools. Teachers in the public-school system numbered about 29,450 in elementary and 21,950 in secondary schools. In the early 1970's private institutions included about 180 elementary schools with some 40,000 students, and about 95 secondary schools with 18,000 students. Teachers in private schools numbered about 2650.

UNIVERSITIES AND COLLEGES. In the early 1970's Virginia had sixty-one institutions of higher learning, thirty-three of which were private. University and college enrollment was about 149,000. Public institutions include the University of Virginia, Virginia Polytechnic Institute (qq.v.), Virginia Commonwealth University, the College of William and Mary, Longwood College, Madison College, Old Dominion University, and Virginia Military Institute. Private institutions include Hampton Institute, Washington and Lee University (qq.v.), Hampden-Sydney College, Hollins College, Roanoke College, Sweet Briar College, and the University of Richmond.

Libraries and Museums. Virginia has a comprehensive system of free libraries, notably the University of Virginia Library, which has over 1,577,000 volumes. Leading special libraries are the Virginia Historical Society Library, the Confederate Museum Library, and the Valentine Museum Library, all in Richmond. Cultural institutions include the Mariners' Museum, in Newport News, with a large collection of ships and models; the United States Marine Corps Museum, in Quantico, with displays including the history of the development of automatic weapons systems; The Virginia Museum, in Richmond; and the Abby Aldrich Rockefeller Folk Art Collection, in Williamsburg.

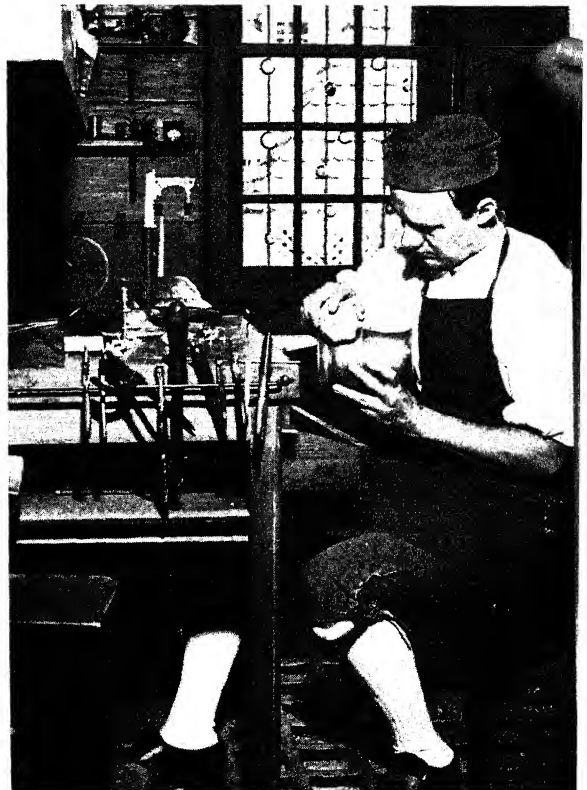
THE ECONOMY

Virginia has a diversified economy. Per capita personal income was \$6276 in 1976, compared with \$6441 for the U.S. as a whole. Agriculture employs about 5 percent of the State's workers. Nonagricultural workers are employed, in descending order of numbers, by government (including the military); manufacturing; wholesale and retail trade; service industries; construction; transportation and public utilities; and finance, real estate, and insurance. The State's residents include many who have jobs with the Federal



Above: Reconstruction of the hall of the Virginia House of Burgesses in Williamsburg, where the first legislative assembly in America held its meetings. Below: A silversmith at work in a reconstructed shop in Williamsburg.

Colonial Williamsburg



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government in the neighboring District of Columbia.

Manufacturing. According to a recent survey of manufactures, production workers in Virginia total about 301,000. The largest numbers are employed in the manufacture of textile-mill products, apparel, food, chemicals, and furniture. About 13 percent are employed in the Standard Metropolitan Statistical Area (q.v.) of Richmond. Other metropolitan centers are Kingsport-Bristol, Newport News-Hampton, and Lynchburg. The annual value added by manufacture (see *VALUE*) in the largest industries in the mid-1970's was \$954,900,000 for chemicals, \$870,000,000 for tobacco products, \$794,900,000 for food products, and \$639,000,000 for electric and electronic equipment. Textile-mill products and apparel, ranking respectively first and second in employment, ranked fifth and eighth in value added, at \$530,200,000 and \$330,000,000. The annual value added by all manufacturing in the mid-1970's was about \$8.4 billion.

Agriculture. Virginia's principal agricultural commodities (in order of cash receipts) are dairy products, tobacco, cattle, and broiler chickens. In the mid-1970's the State ranked third in the U.S. in tobacco production. Other important crops include peanuts, hay, and corn. About 89,000 persons work on some 72,000 farms covering about 11,000,000 acres; the average size of a farm is 153 acres. In the mid-1970's Virginia's total cash receipts from agriculture were about \$1 billion annually. Of this total, about \$554,976,000 was from livestock, about \$482,101,000 from crops. The State ranked thirty-first in the nation in cash receipts from agriculture.

Fishing. Virginia is one of the Chesapeake Bay States. Its fisheries provide economically important quantities of menhaden, clams, crabs, and oysters. Commercial fishermen in the State number about 7650. The catch varies considerably; it was about 530,490,000 lb. annually in the mid-1970's. The annual value of the catch during that period was about \$35,667,000. The total annual value of processed fishery products amounted to \$66,693,777, and the most valuable of these products was shucked oysters.

Mining. Virginia is rich in mineral resources. Its principal products, in order of value, are coal, stone, cement, and sand and gravel. Coal is the State's most important mineral; more than 35,000,000 tons per year were produced in the mid-1970's. During that period Virginia ranked fifteenth in the U.S. in value of mineral production, with a total annual production valued at about \$1.3 billion.

Energy. Generating plants in Virginia, with a capacity of 10,200,000 kw, produced about 39.2 billion kw hours of electrical energy annually in the mid-1970's. Somewhat less than 2 percent of the production and more than 7 percent of the capacity were publicly owned. Among the sources of power are four major utility-operated nuclear reactors and a 300,200-kw hydroelectric installation at Upper Smith Mt.

Forestry. About three fifths of the forest land of Virginia consists of hardwoods. The commercial forest land, primarily under private ownership, comprises some 16,000,000 acres. It produces a net annual cut of sawtimber of some 1,187,000,000 bd.ft.

Tourism. Tourism makes an important contribution to the economy of Virginia. Tourists spend about \$1.6 billion in the State each year. Nearly one tenth of Virginia's land and inland water area is devoted to recreational use. This large area includes Shenandoah National Park, 19 State parks, 2 national forests, and a national seashore. The State's numerous and varied historic sites also draw many visitors.

Transportation. The first railroads in Virginia were the Chesterfield Railroad (1831), later abandoned, and the Petersburg Railroad (1832), which was subsequently absorbed by a larger railway line. Today the State is served by fourteen railroads with a total of 3843 mi. of track. Rural and municipal roads total about 63,000 mi.; Federally assisted primary and secondary highways total some 24,247 mi., including 1065 mi. in the Interstate Highway System. The Port of Hampton Roads, Virginia's chief port, includes facilities at Newport News, Norfolk, Portsmouth, and Chesapeake. The State is served by 3 international and 12 local or interstate airlines, with 54 public and 176 private airports.

Communications. The first newspaper in Virginia was the *Virginia Gazette*, founded in Williamsburg in 1736. Today the State has 35 daily newspapers, 14 Sunday newspapers, and about 100 weeklies. Among the leading papers are the *Arlington Northern Virginia Sun*, the *Newport News-Hampton Press* and *Times-Herald*, the *Norfolk Virginian-Pilot* and *Ledger-Star*, the *Richmond Times-Dispatch* and *News Leader*, and the *Roanoke Times* and *World-News*. Of the approximately 135 AM and 65 FM radio stations operating in the mid-1970's, among the oldest was WTAR (1923) in Norfolk. Television stations numbered 21, of which 5 were devoted to educational programming.

GOVERNMENT

Virginia is governed under the constitution of 1902, as amended. Executive authority is vested

in a governor, a lieutenant-governor, and an attorney general, all elected for four-year terms, and other elected and appointed officials. The secretary of state is appointed by the governor. Legislative authority is exercised by the General Assembly, consisting of the Senate, with forty members elected for four-year terms, and the House of Delegates, with 100 members elected for two-year terms. The legislature meets annually. The judicial system includes a supreme court, circuit and chancery courts, and various local and special courts.

Virginia is represented in the United States Congress by two Senators and ten Representatives.

Local Government. Virginia is divided into ninety-six counties and thirty-five cities. The State is unique in that the cities are totally independent of the surrounding counties.

Voting Qualifications. Suffrage is extended generally to U.S. citizens eighteen years of age who meet the residence requirements (six months in the State and thirty days in the election district).

HISTORY

The name Virginia was given by Elizabeth I (q.v.), Queen of England, to the country explored by an expedition under the auspices of Sir Walter Raleigh (q.v.) in 1584. The actual history of the region begins with the grant by King James I (q.v.), on April 10, 1606, of a territory 200 mi. wide between 34° and 45° N. lat. to two companies, usually called the London and Plymouth companies. By this charter, the London Company (q.v.) was authorized to colonize between 34° and 41° N. lat. and the Plymouth between 38° and 45° N. lat., provided the colonies were 100 mi. apart. The government was vested in a Royal Council of Virginia in London, and provisions were made for a local constitution and an annual president for the colony. The land was to be held in free and common socage, and the settlers and their children were "forever to enjoy all liberties, franchises, and immunities enjoyed by Englishmen in England". The London Company, holding the southern grant, was organized under Sir Thomas Smith, the treasurer. Christopher Newport (d. 1617) sailed for America with the first English colonists and arrived at Cape Henry on April 26, 1607. Having explored Chesapeake Bay, Newport entered the James R. and on May 14, 1607, founded Jamestown (q.v.), the first permanent English settlement in America. Newport returned to England, but the colony did not fare well. Malaria, Indian hostility, insufficient provisions, and unaccustomed labor reduced the number of settlers,

one of whom was John Smith (q.v.), to half in less than four months. When Newport returned on Jan. 12, 1608, only thirty-eight men were left.

Growth. John Smith became president of the colony in 1608. In 1609 a new charter incorporated the London Company, enlarged its territory, and vested the government of the colony in the treasurer and council of the company in London. More ships and colonists were sent to Virginia, and new towns were founded. John Rolfe (q.v.) established the tobacco-growing industry that was to insure the success of the colonial venture, and in 1614 married Pocahontas, daughter of the powerful Indian sachem Powhatan (qq.v.), thus improving relations between the colonists and the Indians. On July 30, 1619, was convened the first representative assembly in America (a council elected by the company and a house of burgesses chosen by the free colonists). In the same year, the first Negro slaves were introduced into the country; see SLAVERY. By 1620 the population of the colony had reached 4000, including apprentices, indentured servants, and some petty convicts sent over by the king, who was becoming bitterly hostile to the company. In 1624 the king revoked the charter and Virginia became a royal colony. Although Indian massacres occurred in 1622 and 1644, the colony prospered with the growth of the tobacco industry, and the population in 1648 reached 15,000. In 1632 Charles I (q.v.) granted a portion of the territory to George Calvert, 1st Baron Baltimore (see under CALVERT).

Virginia briefly resisted the Cromwellian government that replaced the government of Charles I following the Great Rebellion in England, but in 1652 the colony surrendered when Parliament sent a fleet to Virginia. Upon the collapse of the Commonwealth in England, the colony elected Sir William Berkeley (q.v.) governor. Following his coronation, Charles II (q.v.) encouraged the slave trade, burdened the economy of the colony with the Navigation Acts, and granted vast tracts of land to court favorites. These acts, together with the control of the government by a small privileged class, and Governor Berkeley's refusal to send soldiers to protect the frontier from Indians, precipitated a popular uprising led by Nathaniel Bacon (q.v.); see BACON'S REBELLION. When Bacon died in 1676, his rebellion, which had been successful to that point, collapsed. Regaining power, Berkeley took severe measures against his opponents, of whom twenty-three were executed, eliciting from Charles II the remark, "That old fool has hanged more men in that naked country than I

VIRGINIA

have done for the murder of my father." Berkeley was censured by Charles and returned to England to defend himself, but died before seeing the king. The rebellion is now regarded as having been the forerunner of the American Revolution (q.v.).

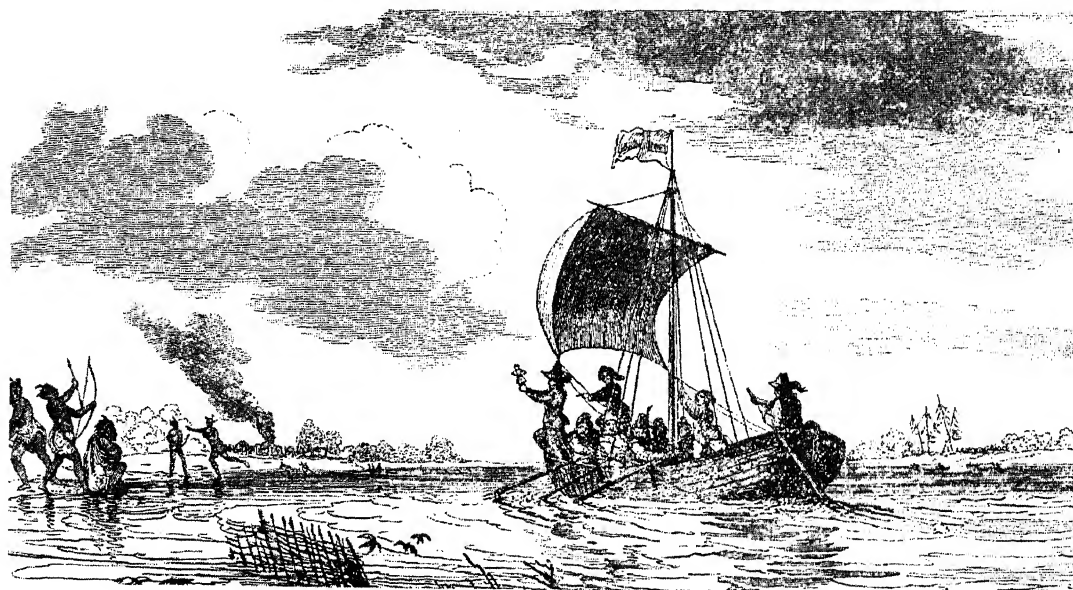
The charter of 1609 had fixed the limits of Virginia at 200 miles N. and 200 miles S. of Old Point Comfort, and west and northwest from sea to sea. Maryland and Pennsylvania also claimed western lands claimed by Virginia, but the title of the colony to a large part of the Northwest Territory (q.v.) was undisputed until the French, moving south from Canada, settled in the region, which had been explored by Jacques Marquette (q.v.). The Ohio Company, composed chiefly of Marylanders and Virginians, was formed in 1749 for the exploitation of the Northwest Territory. During the French and Indian War (q.v.), Virginians saved the British army under General Edward Braddock (q.v.) from complete annihilation, and the Virginians organized by George Washington (q.v.) successfully held the Virginia frontier against the Indians and the French. In 1776 Kentucky, a part of the western territory of Virginia, was organized as a separate county.

Revolutionary Activities. Before the Revolution Virginia led the colonies in their resistance to England. The famous speech of Patrick Henry (q.v.) in opposition to the Stamp Act (q.v.), de-

livered in 1765 before the House of Burgesses, was quoted throughout the colonies, and three of his five resolutions against taxation without representation were adopted. The British general Thomas Gage (q.v.) later said that "Virginia gave the signal to the continent." Although dissolved by the royal governor for a second time, the House of Burgesses met in revolutionary convention at Raleigh Tavern in 1774 and proposed a Virginia convention and a general congress of the thirteen American colonies. Committees of safety were organized and forces raised in every county. In June, 1775, the royal governor attempted to quell the threatening revolution, but he was driven to refuge aboard a ship by a mob. George Washington (q.v.) was elected commander in chief of the Continental armies, and Patrick Henry was elected to head the Virginia forces. In addition to Washington and Henry, the colony furnished other great Revolutionary leaders, including Thomas Jefferson, George Mason (qq.v.), and Richard Henry Lee (see under LEE).

Following the Revolution, the conflicting land claims of other States, and the refusal of Maryland to sign the Articles of Confederation (q.v.) unless these conflicts were resolved, led Virginia to cede its portion of the Northwest Territory to the Union, reserving only a small part for Virginia war veterans. The transfer, conditioned on the establishment therein of new States, was formally executed in March, 1784. Later, Kentucky also was relinquished to become a separate State. Virginia was prominent in advocating a general convention to make necessary

Arrival of the English at Roanoke. In 1585 the Virginia Company from London established the first English colony in North America on Roanoke Island, now part of North Carolina.



changes in the Articles of Confederation. When the Constitutional Convention produced the Constitution of the United States (q.v.), many able patriots, including Henry, Lee, and Mason of Virginia, bitterly opposed its ratification as destructive to States' rights (q.v.). After long debate, Virginia finally ratified the document by a small majority. During the first thirty-six years of the nation, Virginians held the Presidency for thirty-two years and the proportion of Virginia citizens in other high Federal offices was very large.

Civil War and After. Although recognized by statute in 1661, the slave trade was prohibited in Virginia in 1778, and Thomas Jefferson, in the revision of the Virginia Code in 1779, proposed emancipation and colonization of the slaves. During the years before the Civil War, Virginia acted as a moderator between the deep South and the North on the slavery question; see *CIVIL WAR, THE AMERICAN*. In spite of the capture of Harpers Ferry (now in West Virginia) in 1859 by John Brown (q.v.), and his plan to raise a slave insurrection, Virginia opposed secession. Virginia suggested a peace convention of the States and sent commissioners to Washington in an effort to prevent hostilities. The State convention met on Feb. 13, 1861, to decide the question, and as late as April 1 it voted (89 to 45) against secession. It was the call for troops by President Abraham Lincoln (q.v.), however, that decided Virginia, as it decided other Southern States, to abandon the Union, and on April 17 an ordinance of secession was voted by the convention. Robert Edward Lee (see *under* *LEE*), a Virginian then an officer in the United States Army and a former superintendent of the United States Military Academy, resigned his commission, eventually becoming commander in chief of the Confederate army. Richmond was made the capital of the Confederate States of America (q.v.). The western portion of the State had little sympathy for secession, and during the war the Federal government recognized West Virginia (q.v.) as a separate State.

Following the Civil War, the Reconstruction (q.v.) gave Negroes the right to vote for State convention delegates, and a new constitution was adopted in 1868 embodying Negro suffrage; but so great was the popular feeling against it that the constitution was not submitted to the people until July, 1869, when it was adopted. Virginia was readmitted to the Union on Jan. 26, 1870. A new constitution in 1902 suppressed the Negro vote by stipulations with regard to property and literacy.

Virginia's industrial growth has traditionally

centered on the cigarette, textile, and shipbuilding industries. But jobs were often scarce and, until the 1930's, thousands of persons left the State to seek employment elsewhere. Federal job programs during the Depression years finally helped to reverse this exodus, and the 1940's and 1950's saw many new industries and residents attracted to the State. In the late 1950's Virginia entered a critical period in civil rights, when some counties closed public schools rather than desegregate them. But Federal courts ruled this action illegal, and in the mid-1960's integration began to advance. The State's economic life continued to expand during this period, notably in the manufacture of chemicals, clothing, electrical and transportation equipment, and furniture. Today Virginia pursues a program of steady improvement in social and public services, while also encouraging a considerable tourist trade at the State's many historic sites and recreational facilities.

VIRGINIA, city of Minnesota, in Saint Louis Co., about 54 miles N.W. of Duluth. Situated near the Mesabi iron-ore range, the city is a mining and trade center, with foundries and wood industries. It is the site of Mesabi State Junior College, established in 1921. Virginia was incorporated in 1895. Pop. (1960) 14,043; (1970) 12,450. **VIRGINIA BEACH**, independent city in Virginia, S.E. of Norfolk, which it adjoins. It is bounded by the cities of Norfolk and Chesapeake on the W., Chesapeake Bay on the N., the Atlantic Ocean on the E., and North Carolina on the S. An extensive area of beach resorts and rural farmland, it is crossed by the Albemarle and Chesapeake Canal (a part of the Intracoastal Waterway) and includes the Back Bay game refuge of 4589 acres in the S.E., Camp Pendleton State military reservation, Sandbridge and Virginia Beach areas (38 mi. of ocean front), and popular hunting areas in the S.

Numerous villages are included within the city limits. Of interest are Princess Anne, former county seat and now seat of the city hall; Oceana, with a naval air station; and Lynnhaven, an oyster-fishing village on Lynnhaven Bay and site of the Adam Thoroughgood House (1636). Cape Henry is the site of Seashore State Park, Fort Story, a lighthouse (1791), and the memorial to the first settlers, forming a part of the Colonial National Historical Park. At Little Creek is the entrance to the Chesapeake Bay Bridge-Tunnel and a U.S. Navy Amphibious Base, and at Diamond Springs is the Truck Experimental Station of Virginia Polytechnic Institute. Virginia Beach proper is a major seaside resort and contains the Alan B. Shepard Civic Center, with a

VIRGINIA BLUEBELL

convention hall. Other rural villages include Londonbridge, Ocean Park, Davis Corner, Blackwater, Creeds, Bayside, Pungo, Seatack, and Thalia. The inland areas are agricultural, producing green beans, Irish and sweet potatoes, soybeans, corn, wheat, fruit, poultry, hogs, and dairy and nursery products.

The Jamestown settlers first landed at Cape Henry in 1607 before continuing up the James R. The town of Virginia Beach was incorporated in 1906 and became an independent city in 1952. In 1963 the city absorbed all of Princess Anne Co., which had been formed in 1691, and divided it into twelve boroughs in order to facilitate administration of the 255 sq.mi. Pop. (1960) 8091; (1970) 172,106.

VIRGINIA BLUEBELL or **VIRGINIA COWSLIP**. See BLUEBELL; COWSLIP.

VIRGINIA CITY, unincorporated community in Nevada, and county seat of Storey Co., about 20 miles s.e. of Reno. The community lies on the e. slope of Mt. Davidson, at an altitude of about 6500 ft. above sea level. At one time a famous mining town, today Virginia City is chiefly an attraction for tourists interested in one of the most famous of the so-called ghost towns. The celebrated Comstock Lode (q.v.), one of the richest deposits of gold and silver ever discovered, was found nearby in 1859 and the community was settled in the same year, developing rapidly into a boom mining town. Numerous mines were opened along the lode, which yielded about \$340,000,000 between 1860 and 1890. After production declined the population dwindled rapidly. Several of the old, deserted buildings are maintained as museums. Places of interest include Piper's Opera House, where many of the greatest actors and actresses of the period appeared. The first printed newspaper in Nevada, the *Territorial Enterprise*, was published at Virginia City with a reportorial staff that included the author Mark Twain; see CLEMENS, SAMUEL LANGHORNE. Pop. (1970) 695.

VIRGINIA CREEPER. See IVY.

VIRGINIA DEER or **WHITE-TAILED DEER**, common deer, *Odocoileus virginianus*, native to eastern United States. In summer the deer have red-brown fur which changes to gray-brown in winter. The tail is characteristically long, and its underneath part is colored white. The Virginia deer is one of the largest American deer, the buck reaching about 6 ft. in length and about 3 ft. in height at the shoulder, and weighing close to 300 pounds. It is one of the most popular targets of American big-game hunters, but because of strict conservation laws regulating deer hunting, the total number of these deer remains al-

most constant. The full-grown antlers of the male are arched forward and have five or six points. The animals are very swift and canter with their heads and tails erect. Two fawns, born during the spring months, comprise a typical brood; the young have red-brown fur flecked with white spots that disappear during the first winter. See DEER.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY, coeducational, State-controlled land-grant institution of higher learning situated in Blacksburg, Va.; see LAND-GRANT COLLEGES. The university was founded as the Virginia Agricultural and Mechanical College in 1872. In 1896 the name was changed to Virginia Agricultural and Mechanical College and Polytechnic Institute, and in 1944 to Virginia Polytechnic Institute. The present name was adopted in 1970.

The institution is composed of the colleges of agriculture and life sciences, arts and sciences, architecture, business, education, engineering, and home economics. Courses are offered leading to the degrees of bachelor of arts and of science, master of arts and of science, and doctor of philosophy and of education. Graduate work is offered in sixty-two fields leading to the master's degree and in thirty-three areas leading to the doctorate. The Research Division is in charge of thirteen agricultural research stations situated throughout the State.

The Extension Division conducts graduate courses at some fifteen sites in Virginia, as well as conducting workshops, nutritional programs, and other projects requested by residents of a particular city or county. The Extension Division also operates an on-campus conference center for short courses.

In 1973 the university library housed about 750,000 bound volumes. Student enrollment was about 14,470, and the endowment of the university was about \$1,500,000.

VIRGINIA REEL. See ROGER DE COVERLEY, SIR.

VIRGINIA RESOLUTIONS. See KENTUCKY AND VIRGINIA RESOLUTIONS.

VIRGINIA, UNIVERSITY OF, coeducational State-controlled institution of higher learning, situated in Charlottesville, Va. The university was founded and organized in 1819 by President Thomas Jefferson (q.v.) and was opened for instruction in 1825. Jefferson also designed the campus and the original buildings of the university and is generally known as the father of the institution. Clinch Valley College, in Wise, is a branch of the University of Virginia.

The university offers courses in liberal arts, education, commerce, business, architecture,

VIRGIN ISLANDS OF THE UNITED STATES

engineering, law, medicine, and nursing. The university offers the bachelor's degree in sixty fields or programs, the master's in seventy-one fields, the first professional degree in two fields, and the doctorate in sixty-one. In 1972 the university libraries contained approximately 1,800,000 bound volumes, including special collections on local history, Thomas Jefferson, and optics. In 1973 student enrollment was approximately 13,000, and the faculty numbered 1500. The endowment is about \$100,000,000.

VIRGIN ISLANDS, BRITISH, group of islands forming part of the Lesser Antilles in the West Indies (q.v.), and comprising one of the four federated territories of the British Leeward Islands. The principal islands of the thirteen that are inhabited are Tortola, Virgin Gorda, Anegada, Jost Van Dykes, Peter Island, and Salt Island. The capital and only town in the group is Road Town (pop., 1970 est., 2183); it is situated on the s.e. coast of Tortola and is a port of entry. Tortola, the largest island of the group, has an area of about 24 sq.mi. and a population (1970) of 8939. The islands are generally mountainous. The chief products of the islands include fish, fruit, livestock, and vegetables. Discovered by the Italian-born navigator Christopher Columbus (q.v.) in 1493, the islands were acquired by England in 1666. During the 17th century, the Virgin Islands were frequented by buccaneers. Area, about 59 sq.mi.; pop. (1970) 10,484.

VIRGIN ISLANDS OF THE UNITED STATES, formerly the DANISH WEST INDIES, group of three islands and about 50 islets, most of which are uninhabited, in the Lesser Antilles chain of the West Indies, e. of Puerto Rico and lying between the Caribbean Sea and the Atlantic Ocean. The three islands, with area and population (1970), are Saint Thomas (32 sq.mi., 28,960), Saint John (20 sq.mi., 1729), and Saint Croix (80 sq.mi., 31,779). In the 1960's the Virgin Islands experienced a sharp increase in population; pop. (1970) 62,468. The capital is Charlotte Amalie (pop. 1970, 12,220), the only town on Saint Thomas. The only other towns in the group are Christiansted (pop. 1970, 3020) and Frederiksted (pop. 1970, 1531), both on Saint Croix. The 15,150-acre Virgin Islands National Park was established on Saint John in 1956. The park encompasses about two thirds of the island and contains some 260 species of plants, 100 bird species, and vast undersea coral gardens. See NATIONAL PARK SERVICE.

Industry. Important to the Virgin Islands is tourism. In the late 1960's, retail trade accounted for \$105,875,000 in sales; some 10 percent of all paid employees were engaged in re-

tail sales, and an additional 10 percent were engaged in services provided by recreation, motels, hotels, and other services growing out of tourism. The number of tourists visiting the islands rose from about 200,000 in 1960-61 to some 1,100,000 in 1968-69; in the same period, spending by tourists grew from \$26,000,000 to \$100,000,000. Products manufactured in the islands include rum and watches. Oil and alumina processing plants were established in 1966.

Location. The islands form the easternmost outpost of the United States and are so situated as to protect U.S. holdings in the Caribbean Sea and the Panama Canal Zone. Charlotte Amalie has a fine harbor, which can shelter up to twenty-three warships, and a large submarine base. The United States Marine Corps maintains an air base on Saint Thomas and an airfield on Saint Croix.

Education and Government. Education is compulsory for all children between ages five and a half and sixteen. Free schooling is provided in elementary and secondary schools. In the early 1970's public kindergartens, elementary, and secondary schools had an annual enrollment of about 24,000 pupils. A total of 16 private schools had approximately 5000 students. The College of the Virgin Islands (1963), a public institution on Saint Thomas, had an annual enrollment of about 1450 full- and part-time students.

From 1917, when the U.S. acquired the Virgin Islands, to 1931 the islands were governed by the Department of the Navy. In 1931 jurisdiction was transferred to the Department of the Interior, and a civil governor was appointed by the President. The unicameral legislature is elected for two-year terms and comprises 15 senators, 5 each from Saint Croix and Saint Thomas, 1 from Saint John, and 4 at large. Executive power is vested in an elected governor and lieutenant governor, an attorney general appointed by the governor, and other officials. The government comptroller and the judge of the District Court are appointed by the Secretary of the Interior and the U.S. President, respectively.

History. The Italian-born navigator Christopher Columbus (q.v.) discovered the Virgin Islands in 1493, on his second voyage to America, and named them for Saint Ursula (q.v.) and the other virgin martyrs associated with her. Denmark colonized Saint Thomas in 1666. The Danish West Indies Company controlled the group until 1755, when Frederick V, King of Denmark (see under **FREDERICK**), bought the islands. Throughout the 18th century the islands flourished as a center of the slave trade and as

VIRGINIUS AFFAIR

producers of sugar. In 1800, during the Napoleonic Wars, Great Britain blockaded Saint Thomas and in 1801 occupied the island. In 1802 Saint Thomas was returned to Denmark, but from 1807 to 1815 the British again occupied the Danish West Indies. In 1815 the islands were restored to Denmark for a second time. In 1917, after negotiations that had begun before 1867, the U.S. purchased the Danish West Indies for \$25,000,000. In 1946 Judge William Henry Hastie (1904–) was appointed the first Negro governor of the group. In 1948 the 100th anniversary of the abolition of slavery in the Virgin Islands was celebrated. In 1970 Dr. Melvin H. Evans (1914–) became the first elected governor of the Territory; and in 1972 Evans was named the first black chairman of the Southern Governors' Conference of the U.S.

See also LEEWARD ISLANDS.

VIRGINIUS AFFAIR, in American history, a naval incident in 1873 that strained relations between the United States and Spain. The affair involved the American merchant ship *Virginus*, which, on Oct. 31, 1873, during a period when Cuba was rebelling against Spain, was seized on the high seas off Jamaica by the Spanish gunboat *Tornado*. The American captain, thirty-six of the crew, and sixteen passengers of the *Virginus* were summarily executed by the Spanish, the victims including a number of Americans. The massacre brought Spain and the U.S. to the brink of war as a result of great public indignation in the U.S. It was subsequently established, however, that the *Virginus* was owned by Cubans and was illegally registered; she had in fact been carrying arms to Cuba and was fraudulently flying the American flag. Hence she was patently a filibustering ship; see FILIBUSTERING EXPEDITIONS. After some difficulty the diplomatic crisis was settled. Spain did not punish the offending officers and refused a salute to the American flag, but released the *Virginus* survivors and paid an indemnity of \$80,000 to the families of the American victims; payment was also made to families of British victims. On her way back to the U.S., the *Virginus* was wrecked off Cape Fear, N.C.

See also TEN YEARS' WAR.

VIRGIN MARY. See MARY, SAINT.

VIRGO, in astronomy, a constellation denoted by the symbol ♍. It is the sixth sign of the zodiac (q.v.), and was known in ancient times as a harvest symbol. Virgo lies south of the Ursa Major handle (see DIPPER, BIG) on the celestial equator, and contains the first-magnitude star Spica or α Virginis, and a large number of variable stars; see STARS: *Variable Stars*. It is famous

for its nebulae, of which over 500 have been identified; see NEBULA.

VIRTANEN, Artturi Ilmari (1895–1973), Finnish biochemist, born in Helsinki, and educated at the University of Lund, the Finnish Institute of Technology, and the Tekniska Högskolan, Stockholm. He was director of the Biochemical Institute at Helsinki after 1931 and held other academic posts, including that of professor of biochemistry (1939–48) at the University of Helsinki. From 1948 to 1963 he was president of the Finnish Academy of Sciences and Art. He carried out extensive research in agriculture, nutrition, fermentation, and nitrogen fixation and metabolism in plants. Virtanen was awarded the 1945 Nobel Prize in chemistry for developing an acid-treatment method for the conservation of fodder. He wrote *Cattle Fodder and Human Nutrition* (1938) and *AIV System as the Basis of Cattle Feeding* (1943).

VIRUS, infectious agent not truly living and too small to be seen in the ordinary microscope. Viruses are parasitic on all forms of life, including plants, animals, and such microorganisms as bacteria (q.v.). Like living organisms, the virus has the power of self-duplication, but only within susceptible living cells. Unlike organisms, viruses do not subsist by taking in nutrients. The least complicated viruses consist only of genetic material (nucleic acids), nearly always surrounded by a protective coat that allows the viral genome to move from cell to cell. In the laboratory, since viruses cannot be cultivated in a nourishing medium, as are bacteria, they are produced by more complex means: by inoculation of susceptible plants or animals with material obtained from infected individuals; by adding viruses to certain types of tissue grown apart from the living organism in sterile flasks containing suitable nutrients (a process known as tissue culture); or by injecting viruses into the chick-embryo tissues of fertilized eggs.

Nature and Behavior. Viruses pass through filters generally impermeable to bacteria, and their presence was originally deduced only by their effect. Following the development of the electron microscope and of new investigative techniques, scientists acquired extensive knowledge of the size, shape, and properties of numerous disease-producing viruses; see MICROSCOPE: *Electron Microscope*. The particles vary in size from about 10 to 300 millimicrons (a millimicron equals one millionth of a millimeter) and differ widely in shape. Viruses affecting humans are generally spherical and those affecting plants are often rodlike. Many bacteria-attacking viruses, called bacteriophages, are oval, with

an appendage resembling a tail. They are present in sewage and body products.

As early as 1935 biochemical research established that in its independent state the virus is metabolically inert. The virus behaves like a chemical rather than a living organism, although some virus particles contain enzymes that assist in penetrating cells and aid in reproductive activities. It is infective in this state, however, and it may remain outside the cell for varying periods, or until confronted with the susceptible living tissue necessary for its development. The virus propagates only within a cell. Upon maturation of the new virus particles the host cell usually disintegrates, releasing many virus particles in the infective state. Often, however, a host cell releases viruses indefinitely without exhibiting noticeable damage.

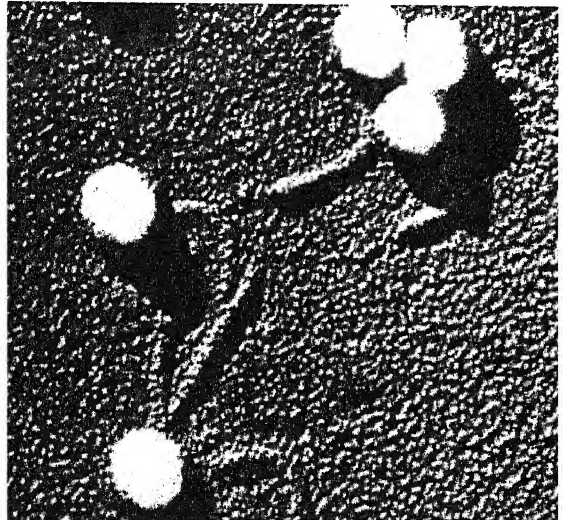
Reproduction. Viruses are composed largely of protein and nucleic acids (qq.v.), often enclosed in a lipoprotein envelope. Within the host cell the virus genes take over the genetic apparatus of the cell and cause it to produce countless new virus particles. The virus genes are able to exchange genetic material with genes of other closely related viruses that may be present in the same cell. They are also able to undergo mutation (q.v.), an ability which accounts for the wide variation in virulence of certain viral epidemics and for the sudden appearance of apparently new viral diseases.

Investigation of the biochemical processes by which the virus reproduces within the host cell is of great significance for what it reveals about the normal chemical processes of the cell. Such investigation is also important in the attempt to discover chemical controls for virus diseases and in cancer research, as several animal cancers are known to be caused by viruses; see **CANCER**. These viruses convert normal cells to malignant cells by altering the genetic characteristics of the host cell.

Viral Diseases. Known viral diseases include chicken pox, hepatitis, influenza, measles, mumps, poliomyelitis, smallpox, yellow fever (qq.v.), cold sores (see **HERPES**), and the common cold (see **COLD, COMMON**). Among the more familiar animal viruses are those causing foot-and-mouth disease, distemper (qq.v.), hog cholera (see **HOG**), and rabies (q.v.), or hydrophobia. In the course of viral disease, antibodies called globulins are produced in the blood; these substances, together with blood cells of a certain type, provide temporary and sometimes permanent immunity (q.v.) to another attack by the same virus. Injections of gamma globulin give brief protection against such diseases as

hepatitis, measles, and poliomyelitis. The use of vaccines promotes longer-lasting immunization. The antipoliomyelitis vaccine prepared by the American physician Jonas Salk (q.v.) in 1954 was the first to be produced by means of tissue culture, a technique developed by the American virologist John Franklin Enders (q.v.). The Salk vaccine was made from killed virus and administered by hypodermic injection. At about the same time the American virologist Albert Sabin (q.v.) developed an oral polio vaccine prepared from attenuated (weakened) live viruses. Introduced on a large scale in 1961, it has now largely supplanted the Salk vaccine. Other vaccines against virus infections include a measles vaccine licensed in 1963, a mumps vaccine licensed in 1967, and a live vaccine against German measles, or rubella, licensed in 1969.

Although viruses are known to cause some



Bacteriophages, the viruses that infect bacteria, magnified 500,000 times in an electron-microscope photograph.

Jean J. Weigle—California Institute of Technology

cancers in animals, there is no proof that they do so in humans. There is suggestive evidence that viruses are involved in Burkitt's lymphoma, a cancer of the lymph glands that affects children in certain parts of Africa, and many authorities believe that viruses cause breast cancer, cervical cancer, and some forms of leukemia. Yet, despite many years of searching for human cancer viruses, and many premature reports of success, such viruses have not been found.

Viruses also are being linked increasingly to a collection of chronic diseases, ranging from arthritis to multiple sclerosis and even heart disease. To date there is solid evidence implicating

VIRUS

viruses only in two relatively rare diseases, sub-acute sclerosing panencephalitis and systemic lupus erythematosus, but this is enough to suggest a new class of so-called "slow" virus diseases, which differ greatly from the usual acute but short-lived viral diseases. Many of the degenerative diseases of middle and old age are now suspected of belonging to this class.

Anti-Virus Agents. In the 1950's Alick Isaacs, a British virologist, discovered that viruses provoke tissue cells to produce a substance called interferon, which interferes with the growth of the virus. Interferon protects the cell producing it from the invading virus as well as from other viruses. However, interferon produced by one animal species does not protect the cells of another species. A team of American researchers headed by Maurice R. Hilleman (1919-) recently discovered that a synthetic form of ribonucleic acid (RNA) may also trigger the production of interferon. Interferon produced in mice, using this form of RNA, protected the mice against otherwise fatal strains of viruses.

Antibiotics, which are effective against bacteria, rickettsia (q.v.), and some other organisms, are generally of no value in combating virus infections, although recent research has suggested that this may not always be the case. In the 1960's it was found that altering the thymine portion of the deoxyribonucleic acid (DNA) molecule in cells inhibits virus growth. The nucleic acid DNA, the main constituent of many viruses, is vital to all forms of life. One chemical agent, iodo-deoxyuridine (IUDR), blocks the growth of the herpes virus in corneal infections, and IUDR and the related bromodeoxyuridine (BUDR) are active against herpes infections of the skin. In 1963 a chemical called isatin-B-thiosemicarbazone (IBT) was introduced as an oral antiviral agent in India against smallpox. Later distributed on a world scale, by 1976 it had virtually eliminated this disease. The orally administered drug amatadine hydrochloride (ATD) has proved an effective preventive measure against various strains of influenza virus, apparently preventing the virus from penetrating the host cell.

Virus Synthesis. The American biochemists Heinz Ludwig Fraenkel Conrat (1910-) and Robley Cook Williams (1908-) announced in 1955 that they had reconstituted the tobacco-mosaic virus. This rod-shaped virus, which produces a blight on tobacco leaves, was separated by chemical means into its component parts, protein and nucleic acids. In the isolated state, the protein was found to be totally inactive, and the activity of the nucleic acids was greatly re-

duced. Assembled in a test tube, the parts recombined to form an active virus, similar in structure to the original one and capable of producing the blight. In 1967 a team of scientists headed by the American biochemist Arthur Kornberg (q.v.) reported the synthesis of a virus that was able to reproduce itself. The artificial virus, identified as Phi X 174, was produced with the help of a natural virus of the same type. The chemical building blocks of DNA plus an enzyme that helps form the DNA molecule were mixed with the natural virus. When the artificial DNA was separated from the mixture and injected into bacterial cells, the molecule produced viruses identical to the natural one. In 1965 Sol Spiegelman (1914-) and his co-workers synthesized in a similar way the RNA of a virus. In 1968 Spiegelman was able to alter the characteristics of a virus with the synthetic RNA. In effect, he forced the virus to evolve into a different form.

See also DISEASES OF ANIMALS; DISEASES OF PLANTS.

D.M.L.

VISA or VISÉ (Fr., from Lat. *visa*, past participle of *videre*, "to see"), formal endorsement placed by governmental authorities on a passport (q.v.), indicating that the passport has been examined and found valid by the nation to be visited, and that the bearer may legally proceed to his destination.

Entry Visa. The most common type of visa is the entry visa, which signifies that the bearer of the passport to which the visa has been affixed has received official permission to enter a country of which he is not a citizen. At the same time, however, a visa issued by a United States consular officer is not a guarantee of admission into the U.S. Upon his arrival in the U.S. the bearer thereof is subject to examination by an immigration officer. The entry visa serves the general purpose of enabling a government to limit and control the entry of aliens into a country. Entry visas are of two general types: the passport entry visa, which is issued to persons desiring to enter a country for a visit of stated duration; and the immigration entry visa, which is issued to persons desiring to enter and settle permanently in the country.

In the U.S. the requirement of entry visas became an integral part of the immigration system in 1917. Prior to that year aliens were permitted to enter the U.S. without a visa but were subject to exclusion on various grounds. The immigration laws were strengthened by Congress during World War I, at a time when strict control over the entry of aliens was deemed an essential aid to the curtailment of enemy espionage and sab-

otage. Several enactments passed since 1918 have fully defined the visa requirements for both immigrants and nonimmigrants and have rendered them increasingly stringent. Racial restrictions on the immigration and naturalization of aliens were removed and provision was made for the immigration of defectors from Communist countries by the terms of the Immigration and Nationality Act of 1952. American consular officers may refuse entry visas to aliens only on specific grounds set forth in the immigration laws. These grounds include mental defect or disability; affliction with a dangerous contagious disease; conviction for a crime or crimes involving moral turpitude; coming to the U.S. for the purpose of engaging in prostitution or immoral practices; likelihood of becoming a public charge; fraud or willful misrepresentation in procuring a visa; ineligibility for U.S. citizenship (with certain exceptions); conviction for a crime relating to illicit traffic in narcotic drugs; illiteracy (with certain exceptions); membership in or affiliation with certain proscribed organizations; and prospective activities in the U.S. believed prejudicial to the public interest, dangerous to the welfare, safety, or security of the U.S., or violative of laws relating to espionage, sabotage, or public disorder. In common with most other governments, the U.S. government takes legal measures to discover and deport aliens who enter U.S. territory without an entry visa or who are deportable on other grounds prescribed specifically in the immigration laws.

Aliens applying to U.S. consular officials abroad for immigration entry visas are normally required to present documentary evidence of their status as responsible and law-abiding citizens of their own country. They must submit to a mental and physical examination and establish their eligibility to receive an immigrant visa. Numerical limitations have been levied on the number of aliens who may immigrate to the U.S. each year. Certain classes of aliens, including the spouses and children of U.S. citizens, are exempted from the numerical limitations. In either case, the aliens must apply for immigrant visas and must qualify under the existing law.

See also IMMIGRATION; IMMIGRATION AND NATURALIZATION SERVICE.

Exit Visa. Some countries require that any of their own citizens desiring to travel or settle abroad obtain exit visas, that is, governmental authorization to leave the country. The exit visa is frequently employed by countries in which the development of unfavorable political, social, or economic conditions has resulted in a marked rise in the amount of emigration. By

restricting the issuance of exit visas, such countries check or may even halt the flow of emigrants. Notable among the governments that have instituted the use of exit visas as well as entry visas at various periods in the 20th century are the Fascist regime in Italy from 1922 to 1943, the National Socialist regime in Germany from 1933 to 1945, and the government of the Soviet Union, which has continued this practice to the present. BUREAU OF SECURITY AND CONSULAR AFFAIRS

VISAKHAPATNAM, city and port of the Republic of India, in Andhra Pradesh State, and capital of Visakhapatnam District, on the Bay of Bengal, 380 miles N.E. of Madras and 470 miles S.W. of Calcutta. A rail-spur terminus in the Eastern Ghats region, the city ships manganese, fish, sugar, and oilseeds. It is the principal shipbuilding center on the east coast; other industries include fish freezing, sawmilling, coir and hemp processing, sugar milling, and distilling. The city has a thermal power station. Educational institutions include the Andhra Medical College and Mrs. A.V.N. College, affiliated with Andhra University (1926). The main campus of the university is in the northwestern suburb of Waltair, a rail junction and bathing resort, which also is the site of the affiliated Saint Joseph's College for Women. Simhachalam, a pilgrimage center 5 miles to the N.W., contains a 12th-century temple dedicated to Vishnu. The city was a mid-17th-century English trading post; it was bombed by the Japanese in 1942. The name is also spelled Visakhapatam, and the city was formerly called Vizagapatam or Vizagapatnam. Pop. (1971) 362,270.

VISALIA, city of California, county seat of Tulare Co., about 36 miles S.E. of Fresno, in the San Joaquin Valley. A processing and trade center for an agricultural area where citrus fruits, olives, and vegetables are raised, the city also manufactures textiles and processes cheese. It is the site of the College of the Sequoias, founded in 1925; nearby is Sequoia National Park (q.v.). Settled in 1851, Visalia was incorporated in 1874. Pop. (1960) 15,791; (1970) 27,268.

VISAYAN ISLANDS, one of the four main insular groups of the Philippines, lying between Mindanao and Luzon in the Visayan Sea. The chief islands are Bohol, Cebu, Leyte, Masbate, Negros, Panay, and Samar. The islands are generally mountainous and are mainly inhabited by Bisayan, a Christianized people.

VISCHER, Peter, the Elder (about 1455–1529), German sculptor and bronze founder, born in Nuremberg, and trained by his father, the sculptor Hermann Vischer the Elder (d. 1488). In 1453 Hermann established a brass foundry at Nurem-

VISCOSITY

berg, which Peter continued after his father's death. Peter's monumental brass productions increased the reputation of the foundry to such a degree that, until it closed in 1550, it was practically without competition in Germany. Peter's five sons assisted him in his work.

In the evolution of German sculpture, Peter Vischer's works mark the transition from the Gothic to the Renaissance style. His most important monument in the Gothic style is the "Tomb of the Archbishop Ernst" (1495) in the Magdeburg Cathedral, with its elaborate base decorated with statues of the apostles. The Renaissance influence is most evident in Vischer's masterpiece, the "Shrine of Saint Sebald" (1508-19) in the Church of Saint Sebald at Nuremberg. Partly the work of his sons also, the shrine is topped by a Gothic canopy and adorned with reliefs and many statuettes, including one of the artist himself.

See GERMAN ART AND ARCHITECTURE: *Sculpture*; GOTHIC ART: *Gothic Sculpture: German*.

VISCOSITY, property of a fluid (q.v.) that tends to prevent it from flowing when subjected to a shearing force. High-viscosity fluids resist flow; low-viscosity fluids flow easily. The tenacity with which a moving layer of fluid drags adjacent layers of fluid along with it determines its viscosity. See FLUID MECHANICS.

Boundary Layer Flows. If a fluid begins to flow under the influence of gravity, according to molecular theory, the molecules from the stationary layers of the fluid must cross a boundary to enter the region of flow; see MOLECULE. Once past the boundary, these molecules receive energy from those in motion and start to move also. Because of the transferred energy the molecules already in motion slow down.

At the same time, molecules from the moving layer of fluid cross the boundary in the opposite direction and enter the stationary layers, giving the stationary molecules a forward impulse. The net result of this two-way movement across the boundary is that the fluid in motion is slowed down, the stationary fluid is set in motion, and the moving layers acquire an average velocity.

To keep one layer of fluid moving faster than another layer requires the continuous application of a force. The magnitude of the force (measured in dynes per square centimeter of surface) necessary to maintain a velocity difference of 1 cm per sec. between layers 1 cm apart states the viscosity in poises, which are states of equilibrium. For water at room temperature (20° C.), the viscosity is 0.0100 poises; at 100° C., or the boiling point (212° F.), the viscosity falls to 0.0028 poises.

Effects of Heat. The viscosity of a fluid decreases with a decrease in density which occurs when the temperature increases. In a less dense fluid, fewer molecules are available per unit volume of fluid to transfer the motion from the moving layer of fluid to the stationary layer. This in turn affects the speeds of the different layers. Momentum is transferred less readily between the layers and the viscosity falls.

In a few liquids the increased molecular speed just balances the decrease in density. Silicone oils, for example, change very little in their tendency to flow with changes in temperature. They are valuable as lubricants when machinery is subject to great temperature changes.

Viscosity is measured in a viscometer, a container with a standard-sized orifice in the bottom. The rate at which the fluid flows through the orifice is a measure of its viscosity.

VISCOUNT MELVILLE SOUND, arm of the Arctic Ocean, Franklin District of the Northwest Territories, N. Canada. About 400 km (250 mi.) long and up to 160 km (100 mi.) wide, it is bordered on the N. by Melville and Bathurst islands and on the S. by Prince of Wales, Victoria, and Banks islands. The sound is linked with the Beaufort Sea, to the W., by M'Clure Strait and with Baffin Bay, to the E., by Barrow Strait and Lancaster Sound. It is clogged with ice during most of the year. The sound was discovered by Sir William Edward Parry (1790-1855), a British navigator, in 1819-20; it was explored in 1850-53 by Sir Robert McClure (1807-73), another Briton. It forms part of the Northwest Passage (q.v.) for ships.

VISHNU, major god of Hinduism and Indian mythology (qq.v.), popularly regarded as the preserver of the universe; two other major Hindu gods, Brahma or Brahman and Siva (qq.v.), are regarded, respectively, as creator and destroyer of the universe. The origin of the worship of Vishnu, whether among the Aryan conquerors of India or among the original Dravidian inhabitants, is obscure. In the ancient Vedas, body of literature called the Veda (q.v.), the sacred literature of the Aryan invaders, Vishnu ranks with the numerous lesser gods and is usually associated with the major Vedic god Indra (q.v.) in battles against demonic forces. In the epics and Puranas (q.v.), writings belonging to subsequent periods in the development of Hinduism, Vishnu (especially in his incarnations) becomes prominent, the second god of the Trimūrti (q.v.), or Hindu triad, (Brahma is the first, Siva the third). Some Puranic literature refers to him as the eternal, all-pervading spirit and associates him with the primeval waters be-

The first incarnation of Vishnu in the form of a fish to recover the sacred books lost in the deluge.

Bettmann Archive



lieved to have been omnipresent prior to the creation of the world. So regarded, Vishnu is depicted frequently in human form, sleeping on the great serpent Shesha, and floating on the waters.

The Preserver. The concept of Vishnu as preserver is comparatively late. It is based chiefly on two beliefs: that men may attain salvation by faithfully following predetermined paths of duty, and that good and evil powers (gods and demons) contend for dominion over the world. Occasionally, the balance of power is upset in favor of evil, and then Vishnu is believed to descend to earth in a mortal form (his avatar) to save mankind or the world. Ten such avatars, or descents, or incarnations, are commonly recognized. Nine descents supposedly have already occurred; the tenth and last is yet to come. Rama and Krishna (qq.v.), the seventh and eighth avatars, are especially honored in modern popular Hinduism, revered both as mortal heroes and as gods. Scholars believe that Vishnu's role as preserver (or redeemer) arose from a practice, characteristic of Hinduism, of assimilating local legendary heroes and gods into the Hindu pantheon by attributing their deeds to one of the major Hindu gods.

Representation. Vishnu is depicted as dark blue or black (his avatars appear in other colors). Normally, he is depicted with four arms:

one hand holds a lotus (its petals believed to symbolize the unfolding of creation); a second holds a conch; a third holds a discus (which always returns by itself after being thrown); and the fourth carries a mace. The conch is said to symbolize that from which all existence originates, whereas the discus and the mace reputedly were obtained by Vishnu as rewards for defeating the god Indra. Vishnu is said to possess also a special sword called Nadaka and a special bow called Sarnga. His wife is Lakshmi (also known as Shri), goddess of beauty and fortune. He rides a huge creature, half-bird and half-man, called Gandara. His home is in a heaven called Vaikuntha (from which the Ganges R. is believed to flow, its source at Vishnu's feet). The god has a thousand names, the repetition of which is regarded as an act of devotion.

VISION, physiological power of sight. Vision is that faculty by means of which, through the material organ, the eye (q.v.), living beings perceive visible appearances of the external world. Vision is mainly concerned with the color, form, distance, and tridimensional extension of objects. It is caused by impact of light waves on the retina of the eye; but if these waves are longer or shorter than a certain limit (see COLOR) they produce no visual impression. The apparent color of an object depends partly on the wavelength or wavelengths of the incident light

waves, single or mixed, and partly upon the state of the eye itself, as in color blindness (q.v.). The apparent brightness of an object depends upon the amplitude of the light waves that pass from it to the eye; and the smallest perceptible difference of brightness always bears a nearly constant ratio to the full intensity of the bright objects.

On ordinary optical principles, a point above the direct line of vision comes to a focus at a point of the retina below its center, and vice versa. If the retina could be looked at by another person, it would be found that an image of the object is formed on the retina, and that this image is inverted. Any increase in the magnitude of the retinal image is generally associated with approach of the object; in the exceptional cases in which this result can be brought about by means of lenses, even where the real distance is increased, the object seems to approach. This seeming approach is the result of an unconscious process of reasoning. The mind, on the basis of tactile experience, interprets any given object as being of a known or ascertained size.

As to single vision with two eyes, the figure shows that, if L and R represent the two eyes and SS a line (the "horopter") drawn through the point A where the optic axes LA and RA intersect, and parallel to a line joining the two eyes L and R, the point A is seen in corresponding points of the two eyes, axially situated; but two points *r* and *l* may be so placed, either in the plane of the horopter or outside it, that the two eyes together perceive them as one point B. In Fig. 1 this point is nearer to the eye and in Fig. 2 farther from the eye than the horopter SS itself. If now, in Fig. 1, a diagram be made representing *l* and A and another representing *r* and A; and if the former be laid before the left eye and the latter before the right eye, the two optic axes being made to converge so that the image of A is formed in corresponding points in the two eyes, the points *l* and *r* will appear to blend into one, situated nearer the eye than A or farther from it; this explains the action of the stereoscope (q.v.), and also the "pseudoscopic" ef-

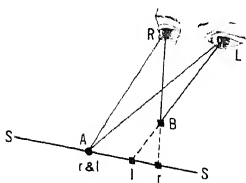


Fig. 1

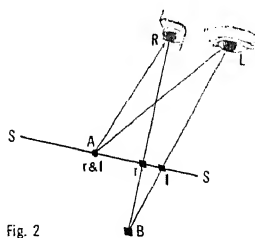


Fig. 2

fect produced when the pictures are reversed. See also OPTICS.

Sight Defects. The commonest disturbance to vision is caused by crystals or other small opaque bodies in the humors of the eye, which are usually only a passing inconvenience. Much more serious are opacities called cataracts, which develop in the lens as a result of mechanical injury, advancing age, or dietary deficiencies; see CATARACT. Opacity of the cornea also causes obscured vision, but this condition may be repaired through transplantation of a section of clear cornea from another person; see EYE BANK.

Day blindness, or hemeralopia, is caused by incipient clouding or opacity of one or more of the ocular tissues. Night blindness, or nyctalopia, results from a deficiency of visual purple in the retina caused by lack of vitamin A. Color blindness is attributable to a congenital defect in the retina or other nerve portions of the optic tract. Amblyopia is weakness of vision without apparent structural damage of the eye and is caused by such factors as poisoning by drugs, alcohol, or tobacco or is associated with hysteria or uremia.

Lack of symmetry in the shape of the eyeball or lack of ability of the muscles of the eye to change the shape of the lens so that it focuses the image accurately on the retina, may result in myopia, or nearsightedness, or in hyperopia, or farsightedness. Myopia may be corrected by the use of biconcave lenses; hyperopia requires the use of convex lenses. Presbyopia is a condition similar to hyperopia, resulting from the natural loss of elasticity of the eye tissues with advancing age, beginning usually in the fifth decade of life. All these conditions are readily corrected by the use of properly fitted lenses; see EYEGLASSES.

Astigmatism is the result of the warping of either the cornea or lens out of the normal spherical contour, with greater curvature along one meridian than another. Aniseikonia is a common condition in which the images produced in the two eyes are of different size.

Defects, weaknesses, or paralysis of the external muscles of the eyeball may cause such defects of vision as diplopia, or double vision, and strabismus, or squint. In incipient cases squint can often be cured by the use of wedge-shaped lenses; in advanced stages surgery of the eye muscles is often necessary.

Pressure on the optic nerve may cause blindness in the right or left halves of both eyes or in the inner or outer halves of both eyes. Detachment of the retina from the interior of the eye-

ball causes blindness by allowing the retina to drift to the bottom of the eye out of range of the image formed by the lens; this condition generally requires surgical intervention for permanent correction. *See also* EYE: *Eye Diseases*. **VISIONS.** *See* APPARITION.

VISTULA, river of central Europe, rising in s.w. Poland, about 40 miles w. of Cracow, on the n. slope of the Carpathian Mts., and flowing n., describing a curve to the e., then another to the w. It enters the Baltic Sea by way of the Gulf of Danzig. About 680 mi. long, the Vistula flows past the cities of Warsaw and Toruń, and becomes navigable for small vessels at Cracow.

VISUAL EDUCATION. *See* AUDIO-VISUAL EDUCATION.

VITAL STATISTICS, branch of statistics that deals with the changes and most basic events of human population, for example, findings pertaining to birth, mortality, marriage, and illness; *see* STATISTICS. Vital statistics are indispensable in studying social trends and making important legislative and commercial decisions; *see* MARKETING: *Marketing Research*. Such statistics are gathered from census (q.v.) and registrars' reports; also, by State laws vital records are kept by physicians, attorneys, funeral directors, clergymen, and similar professional people. In the United States national statistics are compiled and published by the Public Health Service of the United States Department of Health, Education, and Welfare (q.v.).

The most important element in vital statistics is the so-called rate, which customarily represents the average of births or deaths for a unit of 1000 population over a calendar year. The general rates are called crude rates; when these are subdivided into sex, color, age, occupation, or locality, they are known as refined rates.

See BIRTH; DEATH; DEMOGRAPHY; DIVORCE: *Statistics*; LIFE INSURANCE; POPULATION STUDY.

VITAMIN, in physiology, any group of organic chemical compounds required in minute amounts for growth, health, and specific body functions in humans and animals. Vitamins generally function in enzyme systems to enhance metabolism (q.v.) of amino acids, carbohydrates (qq.v.), and fats; *see* ENZYMES; FATS AND FIXED OILS. In most instances, vitamins must be obtained from foods in the diet. Various animal species have different vitamin requirements; some animals, for example, are able to synthesize vitamin C from simple sugars, but humans, monkeys, and guinea pigs must obtain the substance from the diet. *See* NUTRITION, HUMAN.

Diseases such as scurvy and beriberi (qq.v.), which are caused by a vitamin-deficient diet,

were familiar to the early sailor-explorers who subsisted mainly on foods that could be carried on long sea voyages without spoiling. They found that the ailments receded when fresh limes, lemons, or oranges were added to food stores during visits to warm-climate ports. Early Japanese sailors, whose diet consisted mainly of white rice, similarly found relief from the paralysis and wasting of beriberi when fresh meat, fish, and vegetables were added to their diet.

HISTORY

The term "vitamine" was coined in 1912 by the Polish chemist Casimir Funk (q.v.) to describe the anti-beriberi substance that he called a "vital amine". Although this agent was an amine, thiamine, later designated vitamin B₁, the final "e" was subsequently dropped because many of the other chemical compounds in the group are not amines. Although vitamins were first named for diseases or curative powers, such as B for beriberi and K for "koagulation" (in the language of its Danish discoverer), in recent years scientists have adopted specific chemical names. The chemical names are more precise, since many of the substances originally given letter designations have been found to include two or more discrete vitamins. Letter designations still persist, however, as do the early classifications of vitamins according to their water- and fat-soluble capacities. Vitamins A, D, E, and K are fat soluble; vitamin C and the B-complex vitamins are water soluble. In general, fat-soluble vitamins are more easily stored in body tissues, while water-soluble vitamins are not readily retained by the body and must be replenished by regular ingestion of foods rich in these substances.

Discovery of vitamins was a gradual process. The early research involved experiments to produce the symptoms of a disease caused by the lack of a vitamin; *see* DEFICIENCY DISEASES. In a series of experiments in the 1890's, a Dutch physician, Christiaan Eijkman (q.v.) produced beriberi and proved that it could be cured by a constituent of rice polishings. The substance was called vitamin B until other scientists found that the vitamin actually comprised several factors; Eijkman's "antineuritic factor" was then designated vitamin B₁. Since vitamin B was a composite of many vitamins, that group was termed the B complex. In 1925, the American physician Joseph Goldberger (q.v.) demonstrated that the relatively common ailment pellagra (q.v.), characterized by dermatitis, vertigo, and paralysis (qq.v.), was a deficiency disease both curable and preventable by a vitamin of the B complex.

Synthesis of Vitamins. Beginning in the late 1920's, scientists found that many vitamins could be prepared in the laboratory. Since all vitamins are specific chemical compounds, a synthetically produced vitamin will have the same chemical composition and the same effect on the body as one obtained from natural foods. The synthetic vitamins are prescribed to supplement the diets of persons who, because of food allergies or malnutrition, do not obtain sufficient amounts in their diets. Because only minute amounts of vitamins are required by the body, however, and most persons receive adequate amounts in a normal balanced diet, physicians caution against the ingestion of excessive quantities of vitamins A and D. Abnormal doses of vitamin A, for example, may cause drying and cracking of the skin, loss of hair, and failure of normal growth. Excess amounts of some vitamins are excreted by the body.

REQUIREMENTS FOR VITAMINS

After pure synthetic vitamins became available, scientists generally specified the actual weights of pure vitamins in designating the amount of a vitamin required by an animal or present in a given amount of food. Previously, vitamin amounts were determined by the bioassay method: a group of laboratory animals was placed on a diet deficient in a specific vitamin, then fed varying amounts of food known to contain the substance. The desirable amount of vitamin in the enriched food was determined by the minimum quantity required to keep the animal healthy and was expressed in International Units (I.U.). Another method of measurement, using similar techniques, is United States Pharmacopoeia (U.S.P.) Units. These amounts could be extrapolated in terms of units per kilogram of body weight per day. After 1940, a more precise method, microbiological assay, using microorganisms rather than laboratory animals, was initiated. It is more rapid and permits quantitative determination of vitamin needs in very small amounts. In terms of pure synthetic vitamins, one I.U. of vitamin A equals $\frac{1}{40}$ microgram of beta-carotene; a microgram is one millionth of a gram; which in turn is about $\frac{1}{100}$ th of an ounce. One I.U. of vitamin B₁ equals 3 micrograms of thiamine chloride; one I.U. of vitamin C equals 50 micrograms of ascorbic acid.

Exact minimum daily requirements of vitamins for humans are not easily determined. Some scientists contend that, although vitamins may be needed to correct certain deficiency diseases, normal healthy individuals do not require comparable amounts. Under normal conditions, all the vitamins are not required in the

daily diet; the body retains some in varying degrees by storage in the tissues, particularly the liver and kidneys (qq.v.). Changes in metabolism or conditions such as pregnancy or an overactive thyroid gland (qq.v.), however, can affect daily vitamin needs. Certain forms of infection (q.v.) may require greatly increased doses of particular vitamins. A system known as the Recommended Daily Allowance (R.D.A.) is commonly used to indicate the amount of a vitamin that should be included in a human diet. The R.D.A. for vitamin A, for example, is 5000 I.U., approximately double the estimated minimum requirement. The Food and Nutrition Board, a division of the National Research Council, which was organized by the National Academy of Sciences (q.v.), estimates that the average adult eating a well-balanced diet will receive 7500 I.U. of vitamin A. An infant or child requires a larger daily amount of vitamin A than an adult, and a pregnant or nursing mother may need as much as 8000 I.U. per day. The R.D.A. for the various vitamins are listed below in paragraphs specifically describing them.

Diseases caused by vitamin deficiencies are rare in the United States today. The nutritional needs of most persons can be met by readily available foods; with the possible exception of iron supplements for infants and menstruating women, only persons with special medical conditions require routine dietary supplements.

In general, there is little difference between fresh and modern processed foods. Flour, bread, milk, and margarine frequently are improved with added vitamins and minerals by having the thiamine, niacin, riboflavin replaced, and the iron removed by processing. All four ingredients must be included if the product is labeled "enriched"; calcium and vitamin D are optional ingredients. The term "fortified" is applied to foods when one or more ingredients have been added to provide nutrients that may or may not be present naturally in the food. Examples are the addition of vitamin D to milk and iodine to table salt.

VITAMIN ANTAGONISTS

Investigation has revealed the fact that certain substances, whether occurring in nature or synthesized in the laboratory, interfere with the normal activity of specific vitamins. These materials are known variously as vitamin antagonists or metabolic inhibitors. Antagonists to vitamin K, for example, decrease the tendency of blood to clot and thus are valuable in medicine as anticoagulants; see **BLOOD: Coagulation**. Representative of this group is discumarol (q.v.); compare **HEPARIN**. Salicylates, often given in the form

of aspirin (q.v.), also act as antagonists to vitamin K. Some natural food substances also inhibit the effect of specific vitamins. Raw egg white, for instance, contains a protein that combines with biotin, one of the B vitamins, and prevents its absorption in the intestine, causing such symptoms as muscle pain, loss of appetite, and sleeplessness. Prompt relief is obtained upon the elimination of egg white from the diet and the ingestion of additional biotin.

VITAMIN GROUPS

Vitamins were early classified into two categories, the water-soluble and the fat-soluble vitamins. Although these designations still persist, vitamins are now grouped according to the needs of the organism for each and according to their specific physiological effects, as follows.

Vitamin A. Vitamin A is a primary alcohol derived from carotene and the related carotenoid pigments of plants; see **PIGMENT**. These pigments vary in vitamin A values, the most active being beta-carotene, known as a precursor or provitamin; a substance converted into a vitamin by the organism. One molecule of beta-carotene is converted into two molecules of vitamin A in the body. In general, the carotenoids are the plant sources of vitamin A, which never occurs in plants, but is found in butterfat, egg yolk, liver, and fish liver oil. Any number of the carotene provitamins occur in nature and can be converted into vitamin A in the body. They are carried by carrots, sweet potatoes, apricots, spinach, tomatoes, and kale. The yellow carotene in green vegetables is masked by the presence of chlorophyll (q.v.), which also appears to protect the provitamin against destruction by oxidation (q.v.).

Vitamin A is pale yellow, soluble in fats and oils, but insoluble in water; it is stable to heat at ordinary cooking temperatures, but is destroyed by both oxidation and ultraviolet radiation (q.v.). Beta-carotene is oil soluble, crystallizable, orange-red in coloration and, like vitamin A, oxidized and destroyed by air, especially at high temperatures. Canning and freezing cause little loss of vitamin A, but drying and dehydration result in considerable destruction. Rancidity in fats causes destruction of both vitamin A and carotene.

The R.D.A. of vitamin A for adults is 5000 I.U. One I.U. of vitamin A equals $\frac{3}{8}$ microgram of beta-carotene. It is estimated that 7500 I.U. of vitamin A are available in the adult daily diet, of which approximately half is in the form of the provitamin. If large doses of vitamin A or carotene are consumed for long periods of time, toxic effects will result.

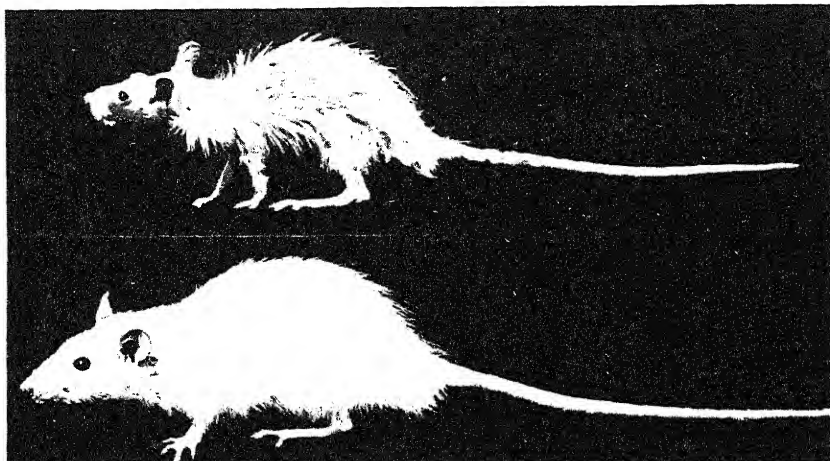
If adequate vitamin A is not provided, the bony structure will fail to grow. Lack of vitamin A also causes an abnormal condition of the tissues that cover the interior cavities and outer surface of the body; this results in excessive dryness of the skin and lack of mucous membrane secretion, creating great susceptibility to bacterial invasion. Xerophthalmia, characterized by malfunction of the tear glands and dryness of the eyes, is caused by inadequate intake of vitamin A. If the condition is not corrected, the cornea of the eye ulcerates, leading to blindness. An early symptom of vitamin A deficiency is night blindness, a difficulty of adaptation to darkness. Vitamin A is necessary for the production of visual purple, or rhodopsin, a retinal substance vital to vision under conditions of low illumination; see **VISION: Sight Defects**.

Vitamin A and carotene are absorbed by the small intestine; vitamin A is more rapidly absorbed than carotene. Absorption is influenced and enhanced in the presence of bile and dietary fat; carotene is not utilized when mineral oil is present in the digestive tract.

Vitamin D. The designation vitamin D is applied to a number of chemically related sterols, some synthetic and others formed from animal and plant precursors. Among the most important are D₃, which is formed from the animal precursor 7-dehydrocholesterol, and D₂, formed from the plant precursor ergosterol. Both are activated by exposure to ultraviolet light. A sterol in human skin that is exposed to ultraviolet light is converted to vitamin D₃. Humans can obtain vitamin D in three ways: by ingesting any form of vitamin D; by ingesting irradiated, sterol-containing foods; and by ingesting sterol-containing foods that become irradiated when the sterol migrates to the skin. Because sterols occur in many different foods, vitamin D deficiency is rare in tropical countries where sunlight is plentiful; it is more likely to appear in cold climates, particularly in cities where people are exposed to little sunlight. Ultraviolet light is blocked by ordinary window glass.

Natural sources of vitamin D are vitamin D-fortified milk, butter, egg yolk, and fish liver oil. In general, normal requirements for vitamin D can be met by exposure of the skin to sunlight. The R.D.A. of vitamin D for children and adults is 400 I.U.; this amount also is recommended during pregnancy and lactation. One I.U. is equal to $\frac{1}{40}$ microgram of pure vitamin D₃.

Vitamin D is necessary for normal bone formation and for retention of calcium and phosphorus in the animal body. It tends to protect dental and bone structure against the effects of



Vitamin deficiency in experimental animals. The rat at top whose diet lacks riboflavin, or vitamin B₂, which promotes health by helping body cells to use oxygen. Bottom rat six weeks later, after receiving foods rich in riboflavin.

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low dietary calcium intake by making more effective use of calcium and phosphorus in the body; it also operates to stabilize calcium and phosphorus levels in the body when intake of the minerals is erratic. Ordinarily, when the calcium level in the blood rises sharply the level of phosphorus falls, but vitamin D restores normal levels.

In growing children, a deficiency of vitamin D causes the disease known as rickets (q.v.), marked by insufficient calcification of the bones and bowleggedness. The deficiency can be corrected by providing adequate milk and vitamin D concentrates in the diet; this is particularly important for pregnant or nursing women. Vitamin D concentrates are regarded as medication rather than food and should be used cautiously; in animal experiments, overdosage of vitamin D produces toxic effects and abnormal calcium deposits. Despite this, heavy doses of vitamin D have been recommended for the treatment of arthritis (q.v.). In normal infants, intakes of 100 I.U. of vitamin D prevent rickets, while infants with this disease are cured by dosages of 300 I.U. per day.

Vitamin E. Like vitamin D, vitamin E includes several separate factors, or a number of different forms of a parent substance. The chemical name for vitamin E is tocopherol; several tocopherols have been found. The most potent and commonly known is the alpha form; a light-yellow viscous oil. Tocopherol is derived from a Greek word meaning to bear offspring; the substance was discovered during the 1920's by a group of scientists, including the American anatomist Herbert McLean Evans (q.v.), experimenting with the influence of diet on the reproductive cycles of rats. The experimental animals, fed a ration lacking tocopherol, were otherwise

healthy but unable to produce young. When plant materials containing tocopherol were fed to the sterile animals, reproductivity was restored in the female, but not in the male.

The role of vitamin E in the human body has not been clearly established. It is, however, regarded as an essential nutrient in more than twenty vertebrate species, including man, according to the Food and Nutrition Board. Vitamin E deficiency is characterized by changes in the blood-making, muscular, circulatory, and central nervous system tissues of the body, as well as the reproductive system in some species, but not in man. By accepting oxygen, vitamin E is able to minimize the loss of carotene and vitamin A in the intestine by oxidation; it also appears to protect red blood cells from destruction by hemolytic agents such as hydrogen peroxide; see BLOOD: *Blood cells*.

The richest sources of vitamin E are green leaves and embryos of the seeds or oils of barley, corn, cottonseed, flax, peanuts, rice, soybean, and wheat. Smaller amounts appear in fat and muscle tissue, milk, and eggs. Vitamin E is fat soluble; it is stable in ordinary light, but is destroyed by prolonged ultraviolet radiation. It is not seriously affected by cooking, drying, steam distillation, or sterilization. It is very sensitive to slight oxidative changes in the fats in which it occurs, but it tends to protect oxidative destruction of fat. The requirement for vitamin E in humans is not known.

Vitamin K. Discovered in 1939 by the Danish biochemist Carl Peter Henrik Dam and the American biochemist Edward Adelbert Doisy (qq.v.), vitamin K occurs naturally in two forms. K₁ is found in green leaves; K₂ is produced by bacterial synthesis. Many structural modifications of vitamin K have been synthesized. One

water-soluble form, menadione, is more potent and widely used than natural vitamin K. The synthesis of vitamin K by plants and bacteria suggests that it is required for the maintenance of life, but its action on plants has not been determined. Vitamin K is required by all animals so far investigated, but the exact amount needed by different species is unknown.

Vitamin K is necessary for the coagulation of blood. Its function is to assist in the formation of an enzyme called prothrombin which, in turn, is needed to produce fibrin for blood clots. When blood-clotting ability is not normal, doses of vitamin K are often given before surgical operations.

The richest sources of vitamin K are alfalfa and fish livers, which are used in making concentrated preparations of this vitamin. Dietary sources include all leafy green vegetables, egg yolk, soybean oil, and liver. The exact minimal requirement of vitamin K for humans is unknown. For the healthy adult, a normal diet and bacterial synthesis in the bowels usually are sufficient to supply the body with vitamin K and prothrombin. Digestive disturbances may lead to defective absorption of vitamin K. A mild type of blood-clotting disorder may develop when the normal intake is reduced as a result of inadequate diet, functional digestive disorders, or systemic disease.

Vitamin C. Ascorbic acid, a carbohydrate derivative, is the only known chemical with vitamin-C activity. It is a white crystalline powder, soluble in water and sensitive to oxidation. It is more easily destroyed than other vitamins; its oxidation is accelerated by heat, light, alkalies, certain enzymes, and trace elements (q.v.).

The exact biochemical function of ascorbic acid is unknown. It appears that the vitamin is important in the formation and maintenance of collagen, the protein that supports many body structures and plays an important role in the formation of bones and teeth. In large amounts, ascorbic acid enhances the absorption of iron from the intestine. It has been suggested that the vitamin is involved in the metabolism of some amino acids and in the function of the adrenal gland (q.v.). Scurvy is the classic manifestation of severe ascorbic acid deficiency. Symptoms that can be related to the loss of the cementing action of collagen are hemorrhages (see BLEEDING), loosening of teeth, and cellular changes in the long bones of children. It has also been suggested that massive doses (from 1 to 4 g a day) of vitamin C can successfully prevent the occurrence of the common cold and influenza in human beings; see COLD, COMMON;

INFLUENZA. No positive evidence of this, however, exists.

Sources of vitamin C include all forms of citrus fruits, fresh strawberries, cantaloupe, pineapple, and guava. Broccoli, Brussels sprouts, spinach, kale, green peppers, cabbage, and turnips, are good vegetable sources. Commercial canning processes that exclude air preserve a large portion of the vitamin C, but most home-canning techniques are destructive of the vitamin; see FOOD PRESERVATION: *Canning*. Storage of fruits and vegetables at ordinary temperatures



Vitamin deficiency in guinea pigs. Top: Guinea pig with scurvy, caused by lack of vitamin C. Bottom: Healthy guinea pig that has had ample vitamin C.

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leads to a gradual loss of the vitamin but refrigeration retards such loss.

The human body cannot store vitamin C; it is therefore important that all meals include foods rich in this substance. The R.D.A. of ascorbic acid is 35 mg for infants, 40 mg for children, 55 mg for adult females, and 60 mg for adult males and for pregnant or nursing females. One I.U. of Vitamin C is equal to 50 micrograms of ascorbic acid.

Vitamin B Complex. When the complex nature of so-called vitamin B was discovered, various numbers were given to its different components. Generally, the only vitamins of the B complex still designated by numbers are B₁, B₂, B₆, and B₁₂; even these are now usually identified by chemical names. All of the B vitamins are water soluble; indeed, some scientists include all water-soluble vitamins, with the exception of vitamin C, within the B-complex group.

THIAMINE. Thiamine, or vitamin B₁, is a color-

VITAMIN

less, crystalline substance with a yeastlike odor and salty taste. It is supplied commercially in a synthetic hydrochloride form. Thiamine is destroyed by high temperatures, particularly when cooked in water containing soda (q.v.). Milling of cereal removes those portions of the grain richest in thiamine; consequently, white flour and polished white rice may be entirely lacking in thiamine. Widespread enrichment of flour and cereal products in general has largely eliminated the risk of thiamine deficiency.

Thiamine is important in the metabolism of carbohydrates. Pyruvic acid, an intermediate substance in this metabolism, cannot be absorbed without the catalytic action of thiamine. Deficiencies of thiamine may result in nervous disorders, loss of appetite, and gastric disorders.

Many foods contain thiamine but few supply it in concentrated amounts. Food sources richest in thiamine are pork, such organ meats as liver, heart, and kidney, yeast, liver sausage, lean meats, eggs, green leafy vegetables, whole or enriched cereals, berries, nuts, and legumes. The R.D.A. is related to the level of carbohydrates in the diet: 0.2 to 0.5 mg for infants, 0.6 to 1.1 mg for children, and 1.3 to 1.5 mg for adults, with additional amounts for pregnant and nursing women.

RIBOFLAVIN. Riboflavin (q.v.), or vitamin B₂, also known as vitamin G, is an orange-yellow crystalline pigment easily destroyed by alkalis and light, but resistant to acids, air, and heat.

Like thiamine, riboflavin serves as a coenzyme—one which must combine with a portion of another enzyme to be effective—in several of the body systems involved in the metabolism of energy nutrients. Riboflavin deficiency in humans may be complicated by a deficiency of other B vitamins; the clinical symptoms of riboflavin deficiency are not as definite as those of a lack of thiamine. The deficiency is characterized by skin lesions and a reddening of the mucous membranes of the lip. Such eye abnormalities as sensitivity to bright light also may be due to riboflavin deficiency.

Sources of riboflavin are organ meats, liver sausage, milk, cheese, meat, eggs, green leafy vegetables, whole grains, and legumes. The R.D.A. for riboflavin is 0.4 to 0.6 mg for infants, 0.6 to 1.2 mg for children, 1.3 to 1.7 mg for adults, 1.8 mg for pregnant women, and 2.0 mg for nursing mothers.

NIACIN. Niacin, or nicotinic acid, is a white, bitter-tasting crystalline compound, fairly stable in heat, light acids, and alkalis. It tends slightly to dilate the blood vessels; in large amounts it reduces the levels of cholesterol (q.v.) in the

blood. In the body, niacin serves principally as a constituent of two coenzymes essential for certain oxidation processes in the cells. One of the functions of these enzymes is the transfer of hydrogen from certain compounds to others in a series of complex reactions. Like thiamine and riboflavin, niacin assists in the release of energy from nutrients.

Niacin deficiency may manifest itself in pellagra (q.v.), but recovery is spectacular when niacin is administered in adequate amounts. Dietary sources of niacin are yeast, liver, peanut butter, lean meats, poultry, canned salmon, green leafy vegetables, and wheat germ. The R.D.A. depends on the number of calories in the individual diet; it averages 21 mg per day for men and 17 mg per day for women, with higher allowances during pregnancy or while nursing. **VITAMIN B₆.** An odorless, white crystalline compound, fairly stable to heat, but sensitive to oxidation and ultraviolet light, vitamin B₆ occurs in several forms. The most active of the group is pyridoxine. A deficiency of pyridoxine is characterized by dermatitis (q.v.) about the eyes, nose, mouth, and ears; in infants the disorder may be marked by convulsion (q.v.). Dietary sources of vitamin B₆ are similar to those of vitamins B₁ and B₂, including liver, muscle and other organ meats, whole-grain cereals, soybeans, peanuts, corn, and a variety of vegetables. The R.D.A. is 0.2 to 0.4 mg for infants, 0.5 to 1.2 mg for children, 1.4 to 2.0 mg for adults, and 2.5 mg for pregnant or nursing women. The recommended intake is found in an average diet.

Vitamin B₆ is actively involved in fat metabolism and is essential to the synthesis of certain amino acids. There is evidence that this vitamin functions also in the metabolism of cholesterol and may influence the development of atherosclerosis, a form of hardening of the arteries; see *ARTERY: Diseases of the Arteries*. In addition, vitamin B₆ functions as part of an enzyme system concerned with the metabolism of protein (q.v.) and is involved in energy transformation in brain and nerve tissue.

VITAMIN B₁₂. Vitamin B₁₂ is a complex cobalt, nitrogen, and phosphorus compound isolated from liver in 1948 following the pioneer work of the American physicians George Richards Minot, William Parry Murphy, and George Hoyt Whipple (qq.v.). Since that time, several closely related compounds have been identified. This substance has been very effective in the treatment of pernicious anemia and sprue; see *ANEMIA*. The vitamin plays an important role in the synthesis of nucleic acids (q.v.), in the metabolic conversion of carbohydrates to fat, and in

the metabolism of fat itself. Some studies suggest that vitamin B₁₂ may stimulate growth in children.

Dietary sources of vitamin B₁₂ are liver, kidney, muscle meats, eggs, fish, milk, and cheese. Exact daily requirements for humans have not been determined, but are estimated at between 1 and 2 micrograms per day.

BIOTIN. Like other B vitamins, biotin is believed to act as a coenzyme. It is readily soluble in hot water, and stable to heat, but sensitive to oxidizing agents, alkalis, and strong acids. Although deficiency of this vitamin is rare in humans, it was through the antivitamin effect of egg white that this substance was discovered; large amounts of egg white interfere with the absorption of biotin in the intestines. Symptoms of biotin deficiency are dermatitis, loss of appetite, muscle pains, insomnia, and a slight anemia. Since biotin normally is synthesized in the intestines, from ingested foods, anything that interferes with the process, including antibiotics, may cause a deficiency; see **ANTIBIOTIC**. Good sources of biotin are organ meats, peanuts, chocolate, cauliflower, egg yolk, and mushrooms. Daily human requirements for this vitamin have not been established but in most cases the needs are met by a normal diet.

FOLACIN (FOLIC ACID). Folic acid was isolated in 1945 and synthesized a year later. It is a yellow crystalline substance, slightly soluble in water and relatively unstable to heat. Although deficiency in humans is rare, folic acid is effective in the treatment of certain anemias and sprue. Dietary sources are organ meats, green leafy vegetables, legumes, nuts, and whole grains. Folic acid is lost in foods stored at room temperature and during cooking. The R.D.A. is 0.05 to 0.1 mg for infants, 0.1 to 0.3 mg for children, 0.4 mg for adults, 0.8 mg during pregnancy, and 0.5 mg during lactation.

PANTOTHENIC ACID. Pantothenic acid occurs with most of the other B vitamins. It is fairly stable in neutral solutions, but is destroyed by acid, alkali, and prolonged dry heat. Although it is an essential nutrient, deficiencies are not observed in humans on normal diets, but deficiency symptoms have been produced in experimental animals by withholding the substance from their diets. It is a component of a coenzyme that participates in the metabolism of fat, in the manufacture of hemoglobin (q.v.), and in the synthesis of steroid hormones; see **HORMONES**. Pantothenic acid is present in most plant and animal foods, but much may be lost in the cooking of meat and the milling of grain. Human daily requirements have not been established.

CHOLINE. A colorless, highly soluble substance with a bitter taste, choline occurs in large amounts in the human body and appears not to be related to any deficiency disease. It is present in almost all body cells and apparently can be synthesized in the body from the amino acid, methionine. It is believed to be essential to the production of acetylcholine, a chemical that helps in the transmission of nerve impulses; see **NERVOUS SYSTEM**. It also functions in the metabolism of protein and fat. The richest sources of choline are wheat germ, legumes, glandular meats, brain, and egg yolks.

INOSITOL. Like choline, inositol is included in the B-complex family because it occurs in the same foods. An alicyclic sugar (see **SUGAR**), it is water soluble and has a sweet taste. Since it is found in foodstuffs and is required by animals and microorganisms in far greater amounts than any other vitamin, inositol may be a component of body tissue rather than a specific nutrient. No deficiency in humans has been reported. Food sources of inositol are heart, liver, wheat germ, yeast, and whole-grain cereals.

REGULATION AND CONTROL

Dietary supplements in the form of multivitamin and vitamin-mineral preparations are sold without a doctor's prescription as tablets, capsules, pills, wafers, powders, and liquids. The amounts of each component of such supplements must be clearly stated on the labels of packages. Certain types of labeling and advertising are prohibited by Federal law, and the Food and Drug Administration cooperates closely with the Federal Trade Commission (qq.v.) to control labeling and advertising. Manufacturers of vitamin and mineral preparations are prohibited from making exaggerated claims about the nutritional value and medical usefulness of the product.

VITEBSK, city of the Soviet Union, in the White Russian S.S.R., on the Western Dvina R., about 150 miles N.E. of Minsk. Its diversified industries include the manufacture of construction materials, foodstuffs, machinery, and wearing apparel. Pop. (1970) 231,000.

VITÓRIA, city and port in Brazil, and capital of Espírito Santo State, on an island in Espírito Santo Bay, 75 miles N.E. of Rio de Janeiro. It is linked to the mainland by a bridge. It is a principal commercial center of the State and exports sugar, coffee, rice, and manioc. Vitória is the seat of the University of Espírito Santo (1961). The town was founded in 1535. Pop. (1970) 121,978.

VITORIA, city in Spain, and capital of Álava Province, about 170 miles N.E. of Madrid. The

VITRIOL

trading center for the surrounding agricultural region, Vitoria also has plants producing processed foods and textiles. Pop. (1970) 136,873.

VITRIOL, in chemistry, any hydrated sulfate of a number of metals, such as copper, iron, uranium, or zinc; see SULFUR. The name oil of vitriol is sometimes used for concentrated sulfuric acid (q.v.).

VITRUVIUS POLLIO, Marcus (fl. 1st century B.C.), Roman architect and engineer, born probably in Formiae (now Formie), Italy. He was an artillery engineer in the service of the first Roman emperor, Augustus (q.v.). His ten books on architecture, *De Architectura* ("Concerning Architecture"), the oldest surviving work on the subject, consist of dissertations upon a wide variety of subjects relating to architecture, engineering and sanitation, practical hydraulics, acoustic vases, and the like. Much of the material appears to have been taken from earlier extinct treatises by Greek architects. Although Vitruvius makes few references to buildings of his time, his writings have been studied for the past four centuries as a thesaurus of the art of building before and during the Augustan Age.

VITUS, Saint (fl. 3rd cent.), Christian child martyr (q.v.), born perhaps in Sicily. He appears in legendary accounts as a pagan senator's son who was converted by his nurse Crescentia and his tutor Modestus and martyred with them either in Lucania or in Rome during the reign of the Roman Emperor Diocletian (q.v.). He was one of the Fourteen Holy Helpers, a group of early martyrs venerated especially in medieval Germany. Saint Vitus is the patron saint of comedians, and his aid is invoked by those suffering from various diseases, especially the nervous disorder chorea, with which his name became associated; see SAINT VITUS'S DANCE. He is often represented in a burning cauldron or holding a small cauldron in his hand and having a dog on a leash. His traditional feast day, June 15, is no longer included in the Roman Catholic calendar; see SAINT.

VIVALDI, Antonio (1679?–1741), Italian composer and violinist, born in Venice and trained by his father, who was a violinist at Saint Mark's Church. Vivaldi, who entered the priesthood at an early age, is known to have lived for some years in Darmstadt, Germany. In 1703 he returned to Venice and was appointed music director of the Ospedale della Pietà, a conservatory for orphaned girls; he held this position until 1740. Vivaldi was known in his time both as a composer and as one of the earliest violin virtuosos. His most famous contemporary, the German composer Johann Sebastian Bach (q.v.),



Antonio Vivaldi

Bettmann Archive

who was somewhat younger than Vivaldi, took the older composer's music as a model during his formative years. Some of Vivaldi's works for violin and orchestra and for violin solo exist only as transcriptions, usually for solo harpsichord, made by Bach for study. Of Vivaldi's extant works, the most notable are his compositions in the form known as concerto grosso (q.v.), in which a small group of stringed instruments play in combination with a larger string orchestra. Vivaldi's most famous work in this genre, opus 8, consists of four concerti for one or more violins and orchestra, and is known collectively as *The Four Seasons*. Sometimes considered an early example of program music (q.v.), it uses variations in tempo and dynamics to suggest the effects of the seasons of the year. Like much of Vivaldi's music it is characterized by vigorous rhythms and strong contrasts. The composer's other works for instrumental combinations, such as his celebrated concerti for flute and orchestra and his concerto for two trumpets, were important in the development of the modern concerto (q.v.) and helped to increase the instrumental expressiveness of the orchestra (q.v.). Vivaldi's vocal works include the opera *La Fida Ninfa* ("The Faithful Nymph", 1732), the oratorio *Juditha Triumphans Devicta Holofernis Barbarie* ("Judith's Triumphant Conquest of the Barbarous Holofernes", 1716), and the Gloria in D.

VIVISECTION, term originally designating surgical, or cutting, operations upon living animals for experimentation, but now denoting physio-

logical experimentation of any kind upon living creatures for the purposes of scientific, psychological, or medical research. Experiments categorized as vivisection include inoculation with disease (q.v.); subjection to different temperatures, atmospheric pressure, food changes, or the action of various drugs (q.v.) and medicines; and cutting operations, involving ligation of arteries, exposure of nerves, or removal of vital organs.

Movements for the total suppression of vivisection have been active for years in both Great Britain and the United States. The chief argument against vivisection, based mainly on the undoubtedly cruel experiments carried on before the use of anesthetics, is that the practice is unnecessary and cruel. For the most part, however, the scientific community favors vivisection, if it is conducted in a humane manner, as invaluable if not indispensable to medical and scientific progress.

In the U.S., laws relating to vivisection differ from State to State. In New York State, for example, the public health law provides that the commissioner of public health (q.v.) designate approved laboratories or institutions where experiments involving living animals may be performed, and that he promulgate rules under which such approval may be granted. The law further states that the commissioner shall require that animals be treated kindly and humanely and be properly housed and fed, commensurate with experimental needs and physiological functions under study, and that all experiments involving pain be performed under anesthesia (q.v.). Vivisection performed without approval of the commissioner is a misdemeanor (q.v.). The words "commensurate with needs" leave considerable latitude for interpretation, however, and render the New York law a relatively broad one.

See ANIMALS, CRUELTY TO; MEDICINE; PHYSIOLOGY.

VIZCAÍNO, Sebastián (1550?–1615), Spanish explorer, born in Huelva. After some time in Mexico, he headed expeditions to Lower California in 1596. In 1602–03 he explored and carefully surveyed the Pacific Coast north of Cape Mendocino; discovered a bay, which he named Monterey in honor of the Spanish administrator Gaspar de Zúñiga y Azevedo (1540?–1606), Count of Monterey; and dispatched a vessel northward from Cape Blanco, located on the southwest coast of the present State of Oregon. The vessel reached the mouth of a large river, probably the Columbia R., at the northern tip of Oregon. From 1611 to 1614 Vizcaíno sailed to the Orient, bringing missionaries from Spain to

the Philippines and trying unsuccessfully to establish trade with Japan. His reports on his two voyages to California were published by the Spanish historian Juan de Torquemada (1545?–1617?) in *Monarquía Indiana* (3 vol., 1615); these explorations, together with accounts of Vizcaíno's voyage to the Orient, also appear in *Collection of Voyages to the South Sea* (1811), compiled by the British historian James Burney (1750–1821).

VIZIER (Ar. *wazīr*, "bearer of burdens"), ministerial title applied in Muslim countries to high government officials during the Middle Ages. Viziers held considerable power as councillors of state during the Abbasid caliphate, from 750 to 1258, and also headed state departments in the period of the Ottoman Empire (q.v.); see CALIPH: *The Abbasid Caliphs*. In later centuries head ministers were known as grand viziers, and in wartime they served as military commanders. See TURKEY: *History*.

VLAARDINGEN, town of the Netherlands, in South Holland Province, on the Lek R., about 5 miles w. of Rotterdam. An important shipbuilding center, the town also has large chemical plants. The fishing fleet brings in large catches of cod and herring. In Vlaardingen is a fish market dating from 1778. Pop. (1972 est.) 81,579.

VLADIMIR, city of the Soviet Union, in the Russian S.F.S.R., and capital of Vladimir Region, Russian S.F.S.R., on the Klyaz'ma R., 110 miles N.E. of Moscow. A rail junction, it lies in an area growing cherries, grains, truck-farm products, and potatoes. Industries include cotton milling, fruit canning, textile milling, distilling, dairying, and the manufacture of chemicals, precision instruments, motor-vehicle parts, plastic products, machinery, phonographs, and electrical equipment. The city is a center of early Russian history, the site of the Uspenskiy (Assumption) Cathedral (1150's), the Dmitrievsky Cathedral (1190's), the Golden Gate (1164), old monasteries, museums of history and religious antiquities, an art gallery, and a teachers' college. Founded in 1116, Vladimir was capital of an independent principality from the 1160's to 1238, when it was destroyed by the Tatars. Passing to Moscow in 1364, it grew in importance during the 1700's and became regional capital in 1778. Industry developed during the 1930's. Pop. (1970) 234,000.

VLADIVOSTOK, city and port of the U.S.S.R., in the Russian S.F.S.R., and administrative center of the Maritime Territory, in E. Siberia, on the Sea of Japan, about 425 miles s. of Khabarovsk. Vladivostok is the eastern terminus of the Trans-Siberian railway. The city is the center of

an industrial area, and its principal industries include fish preserving, shipbuilding, woodworking, zinc and copper smelting, and the manufacture of machinery. The harbor is ice-free most of the year, and is kept open during winter months by ice breakers. The port serves as headquarters for fishing and whaling fleets. In Vladivostok is a university founded in 1956. Vladivostok was founded in 1860. Pop. (1970) 442,000.

VLAMINCK, Maurice de (1876–1958), French painter, born in Paris. Largely self-taught, he had been a professional bicycle rider and violinist before becoming an artist. He shared a studio for a brief period after 1900 with the French painter André Derain (q.v.); together they became members of the Fauvists, a group of French painters whose revolt against the traditions of impressionism (q.v.) lasted from 1905 to 1908; see **FAUVISM**. Vlaminck later produced many dark-toned dramatic landscapes in oil. Typical of these are "Chez l'Artiste, Valmondois" ("The Painter's House at Valmondois", 1920, Musée National d'Art Moderne, Paris) and "Le Chemin du Village" ("The Village Road", 1935, Arthur Macrae collection, London). He also wrote several novels and autobiographical works.

VLONË, or **VLORE**, city and port in Albania, and capital of Vlorë District, on the Bay of Vlorë, an arm of the Adriatic Sea, 70 miles s.w. of Tiranë. A fishing port trading in olives, olive oil, and fruit, the city exports petroleum (from the Kucovë oilfield) and bitumen. Industries include tannin extracting, rice milling, and the manufacture of cement, soap, and dairy products. The city has a museum, a theater, and technical schools, and the medieval Kanine Château is 3 miles to the s.e. Beaches lie nearby, and at the mouth of the bay is the island of Sazan (the Italian Saseno), used by the Italians as a fortress in both world wars and by the Union of Soviet Socialist Republics as a submarine base after World War II.

History. The Greek colony of Aulon, founded at the Bay of Vlorë, is known from the 5th century, although the site is mentioned earlier. At times partly independent, the city has been held by the Byzantines, Normans (1081), Serbs (1345), Venetians (1417–64 and 1690–91), and Turks (after 1464). Albanian independence was proclaimed in Vlorë in 1912, but the city was held by the Italians during World Wars I and II and was known as Valona or Avlona. It is also called Vlora and Vlona. Pop. (1970 est.) 50,000.

VLTAVA (Ger. *Moldau*), river of Czechoslovakia. It rises in the Bohemian Forest, and flows s.e. to Vyšší Brod, where it turns n. flowing to its

confluence with the Elbe opposite Mělník, after a course of about 270 mi.

VOCAL CORDS. See **LARYNX**.

VOCATIONAL TRAINING AND GUIDANCE. See **EDUCATION, VOCATIONAL**.

VODKA, distilled alcoholic beverage known traditionally as the Russian national drink. It is distilled usually from a wheat mash (see **DISTILLED LIQUORS**) and sold in concentrations of 40 percent alcohol, or 80 proof, and of 50 percent alcohol, or 100 proof. Vodka is a smooth, unaged, odorless, and colorless liquor with an extremely mild flavor; it is increasingly popular in the United States for use in cocktails.

VOICE AND SPEECH, in combination a learned system of communication requiring the coordinated use of voice, articulation, and language skills.

Voice. Voice, or phonation, is the sound produced by the expiration of air through vibrating vocal cords. For a discussion and diagram of the larynx, the hollow chamber in which the voice is produced, see **LARYNX**.

Voice is defined in terms of pitch (q.v.), quality, and intensity or loudness. Optimum pitch means the most appropriate pitch for speaking and varies with each individual. Both optimum pitch and range of pitch are fundamentally determined by the length and mass of the vocal cords; within these limits, pitch may be varied by changing the combination of air pressure and tension of the vocal cords. This combination determines the frequency at which the vocal cords vibrate; the greater the frequency of vibration, the higher the pitch.

Another aspect of voice is resonance. After voice is produced, it is resonated in the chest, throat, and cavities of the mouth. The quality of the voice is determined by resonance and the manner in which the vocal cords vibrate; intensity is controlled by resonance and by the strength of the vibrations of the vocal cords.

Articulation. Articulation refers to the speech sounds that are produced to form the words of language. The articulating mechanism comprises the lips, tongue, teeth, jaw, and palate. Speech is articulated by interrupting or shaping both the vocalized and unvocalized airstream through movement of the tongue, lips, lower jaw, and soft palate. The teeth are also used for the production of some of the specific speech sounds.

Language Skills and Other Factors. Language (q.v.) is an arbitrary system of abstract symbols agreed upon by any group of people to communicate their thoughts and feelings. Symbols may be verbal or nonverbal, that is, either spoken or

A teacher works on speech exercise with emotionally disturbed children. Mental and emotional disturbances and brain injuries are the most common conditions that interfere with learning ability and cause speech disorders. UPI



written; additionally, nonverbal symbols may be gestures and body movements. In spoken language the skills of articulation are used; in written language, spelling is substituted for articulation. Both auditory and visual skills are essential to the comprehension and expression of language.

Rate and rhythm are factors also to be considered in the evaluation of speech. Connected speech should be neither so rapid nor so slow as to interfere with comprehension of its content. Rhythm is judged mostly in terms of fluency.

Good or so-called normal speech cannot be exactly measured or described. It can be judged essentially only as it seems to be suitable to the sex, size, age, personality, and needs of the speaker.

Speech and Voice Disorders. Because speech is a learned function, any interference with

learning ability may be expected to cause a speech impairment. The most common interfering conditions are certain neuroses and psychoses (see MENTAL DISORDERS; PSYCHIATRY), mental retardation, and brain (q.v.) damage, whether congenital or acquired. Articulation itself may be impaired by such physical disabilities as cleft palate, cerebral palsy (qq.v.), or loss of hearing (see DEAFNESS); it may likewise deteriorate as a result of paralysis (q.v.) of any part of the articulating mechanism. Impairment may also be the consequence of unconscious imitation of poor speech models or inadequate perception of auditory stimuli.

Voice disorders, so-called dysphonias, may be the product of disease or accidents that affect the larynx. They may also be caused by such physical anomalies as incomplete development or other congenital defect of the vocal cords.

A deaf child feels the throat and face muscles of his teacher as she pronounces the name of a familiar object, and then tries to imitate her. Loss of hearing prevents learning by imitation of speech patterns and sounds. Eric Schwab - World Health Organization



VOICE BOX

The most frequent cause, however, is chronic abuse of the vocal apparatus, either by overuse or by improper production of the voice; this may result in such pathological changes as growths on or thickening and swelling of the vocal cords.

Disorders of rate and rhythm are generally either psychogenic in nature (see PSYCHOSOMATIC MEDICINE) or have a basis in some neurological disturbance. One notable example of the latter condition is Parkinson's disease (q.v.).

Speech Therapy. A speech therapist is a specialist who has been trained to diagnose and treat the various disorders of speech, language, and voice. Because physical, neurological, or psychological factors often are either responsible for or are related to the speech disorder, the speech therapist often works as a member of a team, which may include a neurologist, an otolaryngologist, a psychiatrist, a psychologist, a psychiatric social worker, and a speech pathologist.

Speech and voice disorders caused by disease, injury, or physical malformation fall in the province of the physician and surgeon. Once these defects are remedied, the patient is in the hands of the speech therapist and his associates, who are responsible for teaching the speech-handicapped person to hear and monitor his speech accurately, to think appropriately in verbal terms, and to exercise control over speech disordered by incoordination or emotional factors.

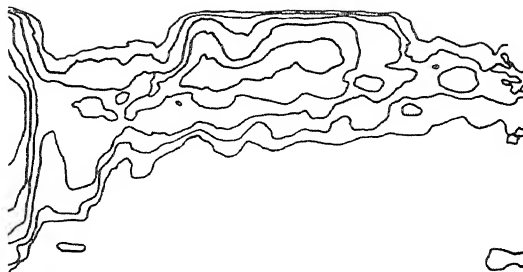
Inasmuch as a hearing loss will prevent learning by imitation of essential speech patterns and sounds and prevent the individual from monitoring his own errors, one of the therapist's most valuable techniques is the measurement of hearing. Since intellectual capacity and the ability to handle language are closely related, the therapist must also understand how intelligence (q.v.) develops in a young child. The most obvious emotional speech disorder is stuttering (see STAMMERING), which is often caused by anxiety. The speech therapist will work to reduce this disability by a program of speech exercises. Where necessary, the aid of a psychologist will be enlisted; in extreme cases, a psychiatrist will be asked to assist with psychotherapy (q.v.).

M.A.Sn. & N.P.A.

VOICE BOX. See LARYNX.

VOICE OF AMERICA. See UNITED STATES INFORMATION AGENCY.

VOICEPRINT IDENTIFICATION, method by which a person can be identified from a spectrographic picture of his spoken words. As identification by fingerprinting (q.v.) assumes that



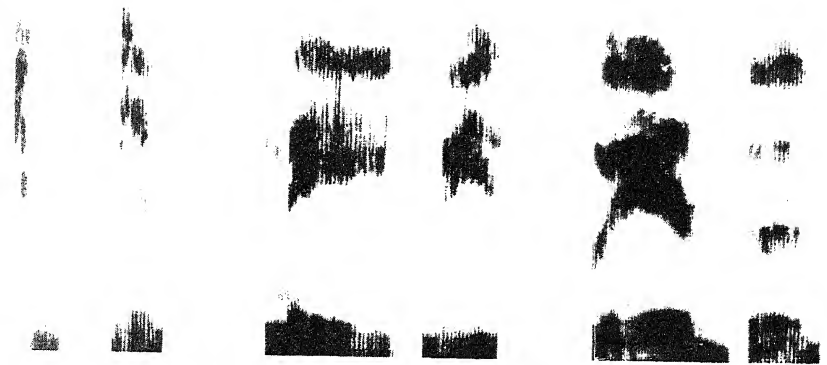
Voiceprint of the word "you". Top: Bar print, so called because of the horizontal bars that describe vocal resonances. The dimensions are time along the horizontal and frequency along the vertical, with loudness indicated by relative blackness of the lines. Bottom: Contour analysis. Each contour line outlines an area of a certain density of blackness, indicating loudness, from the bar print. Each line represents an increase of 6 decibels.

Voiceprint Laboratories, Inc.

no two persons have identical ridges on their fingertips, voiceprint identification assumes that certain physical characteristics of the vocal organs, which influence the quality of sound in speech, will not be exactly the same in any two persons. Those characteristics are the size of the vocal cavities, the throat, nose, and mouth, and use patterns for the muscles of articulation in the tongue, jaws, lips, and soft palate. The voiceprinting process was developed from experiments by scientists who wanted to convert linguistic sounds into visual records that could be analyzed and measured; see PHONETICS. Vocal sounds are converted into electrical impulses and recorded on magnetic tape, as in ordinary sound recording (q.v.), but the impulses are then electronically processed by successive scanning of the original tape recording and thereby converted into a pictorial record on electrically sensitized spectrogram paper. The resultant images can be systematically classified by duration, frequency, and loudness, and can be compared with the images from other sound sources. Voiceprinting is sometimes used by the police to identify persons who make illegal threatening or obscene telephone calls; the system can also identify participants in a recorded

Voiceprint identification record. The illustration shows the information needed to identify an individual voice.

Voiceprint Laboratories, Inc.



NAME

ADDRESS

SEX BIRTH

COLOR HEIGHT HAIR

WEIGHT EYES

FINGERPRINT CLASSIFICATION

DISTINGUISHING MARKS

LANGUAGE CHARACTERISTICS

POLICE RECORD



conversation and has other uses. Attempts to make the system fail by using voice disguises, mimicry, and ventriloquism have failed.

VOICEPRINT LABORATORIES

VOLCANISM, in geology and geophysics, the process of change in the crust of the earth, caused by movements of molten material beneath or through the solid surface of the earth. Several theories are current concerning the fluidity of the magma underlying the earth's crust. Some geologists regard it as the result of heat persisting from a time when the entire earth was a molten mass; others believe that heat generated by the shearing and crushing of deep rock masses in the course of geological change, and the relief of pressure by the arching of solid surface strata in the formation of folds and mountains, is sufficient to account for the fluidity of the material. Such fluid material, forcing a passage along faults or melting its way through rocky strata, manifests itself at the surface of the earth in the formation of volcanoes; see **FAULT**; **VOLCANO**. See also **GEOLOGY**; **GEOPHYSICS**; **IGNEOUS ROCKS**; **LAVA**.

VOLCANO, geological feature consisting of a vent in the earth's crust and a cone of volcanic material; at the top is a bowl-shaped depression which is called a crater. The cone is formed by accumulation of molten or solid matter, which is ejected through the vent from the interior of the earth; see **VOLCANISM**. The study of volcanoes and volcanic phenomena is called **volcanology**.

The great majority of volcanoes are composite in character, that is, are built up partly of lava flows (see **LAVA**) and partly of fragmental materials; Etna and Vesuvius (qq.v.), in Sicily and Italy, respectively, are examples of composite cones. During successive eruptions, the solid materials fall around the vent on the slopes of the volcano, while lava streams issue from the crater and from fissures on the flanks of the cone. Thus the cone is built up of sheets of fragmental materials and flows of lava, which are all inclined outward from the vent. In some cases the enormous, craterlike basins, called **calderas**, at the top of eviscerated volcanoes are eventually occupied by deep lakes, such as Crater Lake in Oregon; see **CRATER LAKE NATIONAL PARK**.

VOLCANO

Many volcanoes began erupting when they were submerged, rising upon the bed of the sea. Etna and Vesuvius were in their earlier days submarine volcanoes, and the same is the case with the vast cones of the Hawaiian Islands and many other volcanic islands in the Pacific Ocean (q.v.).

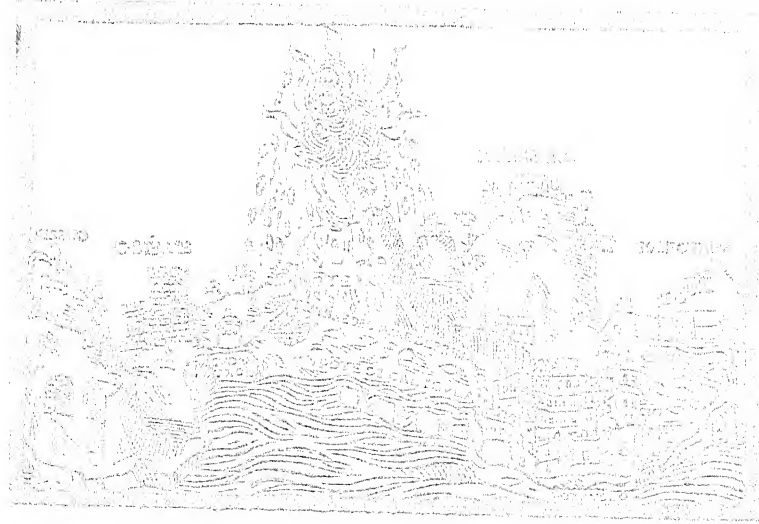
States of Volcanic Activity. Some volcanoes are much more active than others. A few may be said to be in a state of permanent eruption. Stromboli (q.v.), in the Lipari Islands (q.v.) near Sicily, has been constantly active since the days of ancient Greece. Izalco, in El Salvador, Central America, has been active since its initial eruption in 1770. Other constantly active volcanoes are found in a belt in the Pacific Ocean, including those in Hawaii Volcanoes National Park (q.v.), and in a similar belt in Central and South America, including Cuilapa Miravalles in Costa Rica and Sangay and Cotopaxi in the Andes Mts. of Ecuador. Many other volcanoes, such as Vesuvius, continue in a state of moderate activity for longer or shorter periods, and then become quiescent or dormant for months or years. Atitlán in Guatemala was active for some 300 years before 1843 and has since been inactive. The eruption that succeeds prolonged dormancy is usually violent or paroxysmal.

Eruption. In a paroxysmal eruption, the lava is highly charged with steam and other gases, such as carbon dioxide, hydrogen, carbon monoxide, and sulfur dioxide, which continually escape from its surface with violent explosions and rise in a turbid cloud. From this cloud showers of rain are frequently discharged. Large and small portions of the lava are shot upward, forming a fiery fountain of incandescent drops and frag-

ments, which are classified as bombs, cinders, or ash depending on their size and shape. These objects fall back in showers upon the external slopes of the cone or into the crater, from which they are again and again ejected. Lightning often plays through the cloud, especially if the cloud is heavily charged with dust particles. The lava rises in the vent and finally flows over the rim of the crater or oozes, as a pasty mass, through a fissure in the side of the cone. This may mark the crisis, or crucial point, of the eruption, and after a final ejection of fragmental material the volcano may relapse into a quiescent state.

The enormous energy displayed during an explosive eruption is shown by the heights to which stones and ashes are projected. The fine ashes of Krakatau (q.v.) in Indonesia are said to have been carried by the uprush of gas and vapors to the height of 17 mi. The clouds of vapor, mingled with dust, which emanate from violent volcanic eruptions, can cause darkness, even in distant places, that lasts for days.

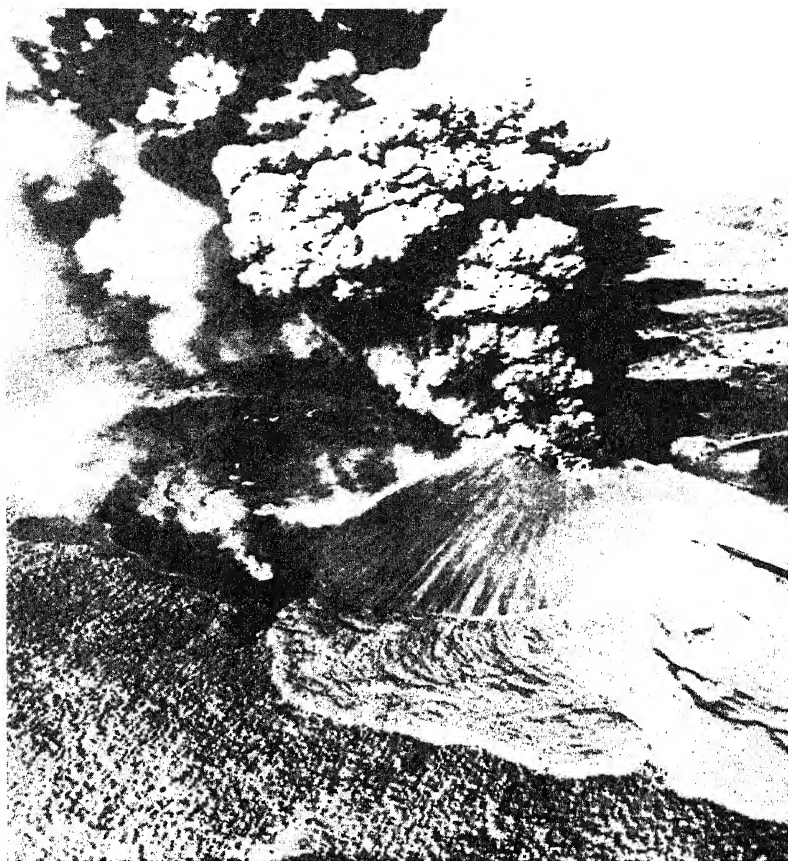
Such paroxysmal eruptions often result in great changes in the appearance of a volcano. The upper part of the cone may disappear, leaving a vast, yawning cauldron. The cone of Vesuvius has frequently been modified in this way. Thus in 1822 the summit was reduced by 800 ft. The entire summit of Papandayan in Java was blown off during a great eruption in 1772, and the four-coned Bandai-san volcano in northern Japan was greatly reduced in height by the eruption of 1888. It is estimated that 1,587,000,000 cu.yd. of rock were blown from the top of the Bandai-san volcano and scattered over an area of 27 sq.mi. The great eruption of



Eruption of Mt. Vesuvius (from a 16th-century woodcut by the Italian artist Delli Falconi).

*Eruption of Cerro Negro
in Nicaragua, in 1968.*

UPI



Tarawera in New Zealand in 1886 showed that both explosion and collapse may accompany paroxysmal action.

Cooling Stage. For a long period after it has ceased to erupt either lava or fragmental materials, a volcano continues to give out acid gases and vapor in what is called the fumarolic stage. After this phase hot springs arise from the volcano. An example of this type of activity may be seen in the geysers of Yellowstone National Park (q.v.) in Wyoming and in the hot springs of the North Island of New Zealand; see GEYSER. Eventually the last traces of volcanic heat disappear, and springs of cold water, which often are impregnated with mineral matter, may issue from the volcano and from the ground in its vicinity. Volcanoes in the United States that have become inactive in recent geologic time are Crater Lake, Mt. Shasta in California, Mt. Hood in Oregon, and Mt. Rainier, Mt. Baker, and Mt. Saint Helens in Washington.

Inactive Period. After becoming inactive, a volcano undergoes progressive reduction in size through erosion (q.v.) caused by water, glaciers, or waves. Finally the volcano may be completely obliterated, leaving only a volcanic pipe, that is, a chimney filled with lava or fragmental mate-

rial, which extends from the earth's surface to the former lava reservoir. The rich diamond mines of South Africa are in volcanic pipes; see DIAMOND: *Formation and Occurrence*.

Lava Flows. In prehistoric times, lava in many cases apparently issued from long, vertical fissures and deluged large areas. The results of some of these inundations of lava can be seen in western North America, as in the great lava plain of Snake River, Idaho. As a rule the volcanoes which emit lava in great volume are comparatively quiet in their action. This is the case with the volcanoes of Hawaii; the paroxysmal eruptions of volcanoes such as Etna and Vesuvius are unknown in Hawaii.

Geographic Distribution of Volcanoes. Active volcanoes are limited to particular regions of the earth. The Pacific Ocean is bounded by an almost unbroken line of active and inactive volcanoes, known as the ring of fire. The Caribbean Sea and the Mediterranean Sea wash the shores of lands having active and recently extinct volcanoes. Geologists have reason to believe that many of the notable volcanoes and volcanic islets of the great ocean basins rise from the backs of ridges and swellings of the earth's crust.

VOLCANO ISLANDS

Theories and Recent Observations. It was formerly thought that the chief cause of volcanic action was the introduction of water to the highly heated interior of the earth. The most probable view is that volcanoes are closely related to those earth movements that have resulted in the flexing and fracturing of the earth's crust. The crust yields to enormous pressure by cracking and wrinkling up, in various linear directions, and it is along these lines of fracture and flexure that molten matter, or magma, and heated gases are able to escape. Several theories are held by volcanologists to explain the action of volcanic gases in producing an eruption. The simplest theory is that the action is similar to that of the gas of a carbonated beverage in producing a fountain of soda water, as when a soda bottle is shaken.

The birth of a volcano and the building of its cone and crater were observed in 1943, when the volcano of Parícutin erupted from a corn-field in central Mexico. On Feb. 5, 1943, the district had been shaken by earthquakes, which continued for two weeks. On Feb. 20, a vent was observed to open and emit first steam and volcanic dust, then hot fragments, and later molten rock. The eruption proceeded almost continuously, and after eight months had built up a cone about 1500 ft. high; the accompanying lava flows buried the village of Parícutin and nearby towns.

A serious volcanic eruption shook the Heimae Island, Iceland, in January, 1973. The Helgafell volcano, thought to have been dormant for about 6000 years, suddenly exploded, pouring out massive quantities of lava and hot-ash debris. The disastrous eruption destroyed or severely damaged most of the homes of the evacuated islanders.

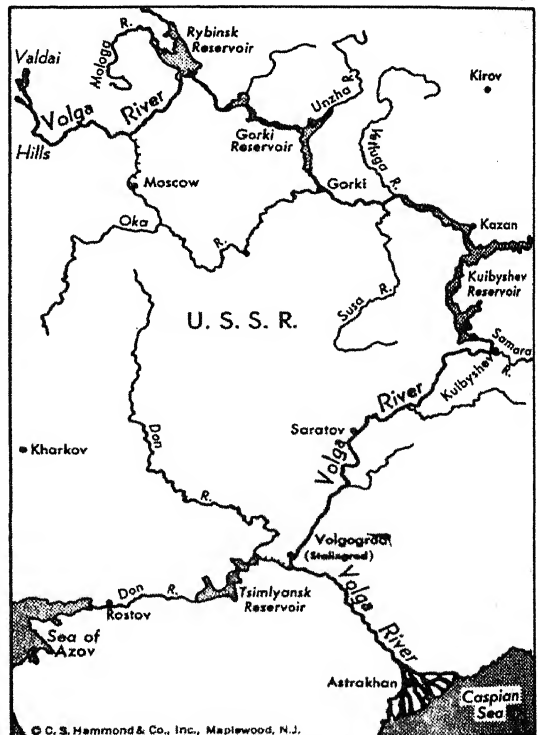
Other Volcanic Phenomena. Mud volcanoes, which may be caused by volcanic activity or by outbursts from underground petroleum deposits (see PETROLEUM), are conical hills of mud, from which material is ejected, generally cold, by and with various gases. The usually quiet emissions of such volcanoes may be interrupted at times by violent discharges, sometimes with columns of flame. Conical hills of volcanic origin are called puy, as those of the Auvergne Mts. in southern France. See also EARTHQUAKE; GEOLOGY; IGNEOUS ROCKS; POMPEII. R.L.N.

VOLCANO ISLANDS, three uninhabited islands in the Pacific Ocean, situated at 24°47' N. lat. and 141°20' E. long., about 650 miles s. of Japan. The islands, which include Iwo Jima (q.v.), were controlled by Japan from 1891 until 1945 when they were occupied by American forces. Under

terms of the Japanese peace treaty in 1952 the United States exercised complete authority over the islands, maintaining an air base on Iwo Jima, until June 26, 1968, when the islands were returned to Japan. The total area is 11 sq.mi. See also BONIN AND VOLCANO ISLANDS.

VOLE, common name for several genera of small rodents in the subfamily Microtinae, which also includes the lemming and the muskrat (qq.v.). Most of the voles are confined to the Eastern Hemisphere, but several species, known popularly as mice, occur in the United States; see MOUSE. The best-known genera are *Microtus*, *Clethrionomys*, and *Arvicola*. Among American species, the most common vole is the field, or meadow, mouse, *M. pennsylvanicus*. The genus *Clethrionomys* is represented in the U.S. by the red-backed mouse, *C. rutilus*. The water vole, *A. terrestris*, is found in Europe and Asia.

VOLGA, longest river of Europe, within the European part of the Russian S.F.S.R., 2194 mi. in length. From its source in a small lake among



The Volga River and its chief tributaries.

the Valdai Hills (q.v.) the Volga flows N. to a point above Moscow, s.e. to Kazan', generally s. to Volgograd, thence s.e. to its mouths in the Caspian Sea. The chief tributaries include the Kama, Samara, Oka, and Vetluga. The Volga and



Monument to the Soldier, on Mamayev Hill in Volgograd. Intourist

its affluents drain an area of some 560,000 sq.mi. The river is navigable for most of its course from about March to mid-December; during May and June it is subject to great floods. Canals connect the Volga with such points as the Baltic Sea, Sea of Azov, Black Sea, Don R., and the city of Moscow. The lower reaches of the river are major fishing areas. The entire Volga valley was claimed for Russia by Ivan IV Vasilievich (see *under* IVAN) during the 16th century.

VOLGA-DON CANAL. See UNION OF SOVIET SOCIALIST REPUBLICS: *The Economy: Transportation.*

VOLGOGRAD, formerly STALINGRAD, city of the Soviet Union, in the Russian S.F.S.R., and capital of Volgograd Oblast, on the Volga R., about 560 miles S.E. of Moscow. The city is one of the most important commercial, industrial, and transshipment centers in the Soviet Union, and is connected by rail with Moscow, the Caucasus region, the iron ore and steel of the Donets coal basin in the Ukraine, and S.W. Siberia. The Volga-Don Canal links the Volgograd port with the Don R. The city is also the central distribution point between the wheat fields of the Volga basin and other Soviet regions. Its industries are oil refining, shipbuilding, and the manufacture of aluminum, chemicals, farm equipment, and iron and steel and lumber products.

History. In 1589 Tsaritsyn, a fortress, was founded on the site of the present-day city to protect the newly acquired Russian land. In its subsequent history Tsaritsyn became a rebel stronghold during revolts against the czars. With the expansion of the Russian Empire in the 19th

century, Tsaritsyn became an important port for products shipped down the Volga. During the Russian Revolution (q.v.) of 1917 the city was taken by Bolshevik troops early in the war. White Russian troops besieged it because of its strategic importance and occupied it for three months in 1919. In 1925 the city was renamed after Joseph Stalin (q.v.), notable in the defense of the city against the White Russians. Stalingrad, greatly developed by the Soviets, was renamed Volgograd in 1961. Pop. (1972 est.) 852,000.

The Battle of Stalingrad. The importance of the city as a communications, oil-distributing, and industrial center and as a gateway to the Volga and Caucasus areas made it a vital German objective during World War II. German troops began attacking on Aug. 20, 1942, after a period of heavy air raids. The Soviet defense of the city became one of the epics of World War II. By Sept. 13 the Germans were in the outskirts of Stalingrad. On Nov. 19 began a successful Soviet counteroffensive designed to cut off more than 300,000 German troops of the Sixth Army by a pincers movement in the German flank. Another force cut off the remainder of the Sixth Army. The Sixth German army, under Fieldmarshal Friedrich Paulus (1890-1957), surrendered on Feb. 2, 1943, ending the German advance into the Soviet Union; see *WORLD WAR II: Conclusion of the War in Europe: The Battle of Stalingrad.*

VOLLEYBALL

VOLLEYBALL, popular team sport, played by smacking an inflated ball back and forth over a high net. Each team has six players and points are scored by successfully landing the ball in the court of the opponents without its being returned. The game was invented in 1895 as a recreational pastime by the American William G. Morgan (d. 1942), physical director of the Young Men's Christian Association chapter in Holyoke, Mass. Now played in all parts of the world, volleyball has recently been included in the Olympic Games (q.v.).

Court and Equipment. The volleyball court, 30 ft. by 60 ft. in area, is divided into two sides, each 30 ft. by 30 ft., by a net higher than the heads of the players. Indoor rules recommend that there be a clear, unobstructed area at least 26 ft. high above the entire court. The net is 32 ft. long and 3 ft. wide and is made of 4-in. square mesh of black or dark-brown linen twine. It is stretched tightly across the court by its four corners. The height of the top of the net is set at 8 ft. for men; for women, at 7 ft. 6in.; and for children, at 7 ft. or lower. A 2-in. wide line, called the spiking line, extends across each of the two playing areas from sideline to sideline, parallel to and at a distance of 10 ft. from the center or net line.

The volleyball is an inflated sphere with a laceless leather cover. Smaller and lighter than a basketball, it is 25 to 27 in. in circumference and weighs 9 to 10 oz. When dropped on a hard surface from a height of 100 in., it should bounce vertically between 60 and 65 in.

Rules. The six players on a volleyball team include three forwards, who stand near the net, and three backs. The server starting the game stands behind the right third of his rear line, serving over the net into the court of the opponents by tossing the ball into the air and striking it with the hand or fist. Only one attempt is allowed on the serve. By hitting the ball back and forth over the net, with the hands, fists, forearms, head, or any part of the body above the waist, play is continued until one team fails to keep the ball in play, that is, in the air, or until a rule violation is committed. The ball must be returned by a side over the net after no more than three hits, and no player may hit the ball twice in succession. The return over the net must be done without catching, holding, or carrying the ball, without a player's touching the net, and without entering the area of the opponents. A point may be scored only by the team that is serving; a player continues to serve as long as his team continues to score points, the service privilege then shifting to the opposing team. On

a service shift, all members of the new serving team immediately rotate, moving clockwise one position, with the player who was in the right-forward position moving into the right-back or serving position.

The team first scoring fifteen points, or the most points in eight minutes of actual ball-in-play time, wins the game, provided there is at least a two-point margin of victory. A volleyball match consists of the best two out of three games. Officials in competitive volleyball include a referee, scorer, umpire, timekeeper, and linesmen.

Strategy. A vital part of volleyball offense is the so-called spike, a powerful smash over the net made suddenly by one of the forwards. To spike the ball a player must jump high in the air, using good timing in punching the ball to place it so that it is virtually impossible to return. Players may spike only when they have shifted, through service rotation, into a forward position; a back-court player may, however, spike from behind the 10-ft. spiking line. A ball well placed, high and near the net for a teammate to spike it, is called a set-up. A tip, or placement, is a lightly hit ball deflected or dropped into the court of the opponents, and is used by a spiker to surprise opposing blockers when they anticipate a powerful spike.

Net recovery is permissible; that is, a ball that has been played into the net on the first or second hit may be kept in play, as long as one player does not hit the ball twice in succession. A ball hitting near the top of the net usually drops swiftly to the floor, but a ball hitting near the bottom of the net usually springs back and can be recovered.

Defensively, single or multiple blocks are sometimes employed in volleyball. In such a defense one or more forward players jump up on their side of the net, with hands and arms placed in front of an attacking spiker, to hit back the spiked ball or deflect it to a teammate who can then return it across the net.

A number of factors contribute to skillful team play. One of these is accurate service, optimally to a weak spot on the opposing side, delivered either with speed or as a deceptive floater, that is, a ball that seems to wobble and slip uncertainly in the air. Control is likewise important in receiving the service, in recovering a spike, and in deflecting the ball accurately to fellow team members. Generally speaking, volleyball teamwork is developed by players working together, each learning intuitively what the others are going to or can do, and practicing various patterns of play.

Competition. In 1922 the first national volleyball championships were held in the United States, and in 1928 the United States Volleyball Association was formed. The International Volleyball Federation was organized in 1947. Thereafter the game made gradual strides in international popularity. It was included in the Pan-American Games (q.v.) in 1955 and was finally included, for both men's and women's teams, in the Olympic Games in 1964 in Tokyo. At these and succeeding Olympic Games the Soviet Union won the men's championship (1964, 1968) and the women's (1968, 1972); and Japan won the men's championship (1972) and the women's (1964, 1976). Poland won the men's championship in 1976.

VÓLOS, city in Greece, and capital of Magnesia Department, on the Gulf of Volos, about 105 miles N.W. of Athens. Vólos is the trade center for such regional products as textiles and tobacco. Nearby are the sites of the ancient cities of Demetrias and Pagasae. Pop. (1971) 51,290.

VOLSTEAD ACT. See PROHIBITION: *Prohibition in the United States: Federal Enforcement Legislation.*

VOLSUNGA SAGA. See NIBELUNGENLIED.

VOLT, practical unit of electrical potential difference or electromotive force; see ELECTRICAL UNITS; ELECTRICITY. The potential difference between two points in an electric circuit (q.v.) is considered as being 1 volt if 1 joule of work is done by 1 coulomb of electricity in passing from one point to the other. A millivolt is one thousandth of a volt and a microvolt one millionth of a volt. See ELECTRIC METERS: *Measurement of Voltage.*

VOLTA, river of Ghana, formed by the confluence of the Black Volta and White Volta rivers at Yeji, and flowing in a s. course through Lake Volta Ghana to Ada, on the Gulf of Guinea. The total length, including the Black Volta, is about 900 mi.

VOLTA, Count Alessandro (1745–1827), Italian physicist, born in Como, and educated in the public schools there. In 1774 he became professor of physics at the Royal School in Como and in the following year he devised the electrophorus, an instrument that produced charges of static electricity. Following his interest in electricity, in 1776–77 he applied himself to chemistry, studying atmospheric electricity and devising many experiments, such as igniting gases by an electric spark in a closed vessel. In 1779 he became professor of physics at the University of Pavia, a chair he occupied for twenty-five years. By 1800 he had developed the so-called voltaic pile, forerunner of the electric



Count Alessandro Volta

battery, which produced a steady stream of electricity; see CELL, ELECTRIC; ELECTROCHEMISTRY. In honor of his pioneering work in the field of electricity, the French emperor Napoleon I (q.v.) made him a count in 1801. The electrical unit known as the volt (q.v.) was named in his honor. See also ELECTRICITY: *History.*

VOLTAIC CELL. See CELL, ELECTRIC; ELECTROCHEMISTRY.

VOLTAIRE, assumed name of FRANÇOIS MARIE AROUET (1694–1778), French writer and philosopher, born in Paris, and educated at the Collège Louis-le-Grand, then a Jesuit institution.

Early Brilliance. He traveled to The Hague as secretary of the French ambassador to Holland. Upon his return to Paris Voltaire became known as a brilliant and sarcastic wit. A number of his writings, particularly a lampoon accusing the French regent Philippe II, Duc d'Orléans (see under ORLÉANS) of heinous crimes, resulted in his imprisonment in the Bastille (q.v.). During his eleven-month detention, Voltaire completed his first tragedy, *Cædipe*, which was based upon the *Cædipus Tyrannus* of the ancient Greek dramatist Sophocles (q.v.), and commenced an epic poem on Henry IV (q.v.) of France. *Cædipe* was given its initial performance at the Théâtre-Français in 1718 and received with great enthusiasm. The work on Henry IV was printed anonymously in Geneva, Switzerland, under the title of *Poème de la Ligue* ("Poem of the League",

1723). In his first philosophical poem, *Le Pour et le Contre* ("For and Against"), Voltaire gave eloquent expression to both his anti-Christian views and his deistic creed; see **DEISM**.

A quarrel with a member of an illustrious French family, the Chevalier de Rohan, resulted in Voltaire's second incarceration in the Bastille, from which he was released within two weeks on his promise to quit France and proceed to England. In 1726 he accordingly moved to that country, where he remained for a period of



Voltaire (bust by the contemporary French sculptor Jean Antoine Houdon)

twenty-six months. Voltaire soon mastered the English language, and in order to prepare the British public for an enlarged edition of his *Poème de la Ligue*, he wrote in English two remarkable essays, one on epic poetry and the other on the history of civil wars in France. For a few years the Catholic, autocratic French government prevented the publication of the enlarged edition of *Poème de la Ligue*, which was retitled *La Henriade* ("The Henriad"). The government finally allowed the poem to be published in 1728. This work, an eloquent defense of religious toleration, achieved an almost unprecedented success, not only in Voltaire's native France but throughout all of the continent of Europe as well.

Popularity at Court. In 1728 Voltaire returned to France. During the next four years he resided in Paris, and devoted most of his time to literary composition. The chief work of this period is the *Lettres Anglaises ou Philosophiques* ("English or Philosophical Letters", 1734). This work, a covert attack upon the political and ecclesiastical institutions of France, brought Voltaire into conflict with the authorities, and he was once more forced to quit Paris. He found refuge at the Château de Cirey in the independent duchy of Lorraine. There he formed an intimate relationship with the aristocratic and learned Gabrielle Émilie Le Tonnelier de Breteuil, Marquise du Châtelet (1706–49), who exerted a strong intellectual influence upon him.

Voltaire's sojourn at Cirey in companionship with the Marquise du Châtelet comprised a period of intense literary activity. In addition to an imposing number of plays, he wrote the *Éléments de la Philosophie de Newton* ("Elements of the Philosophy of Newton"), and produced novels, tales, satires, and light verses.

Voltaire's stay at Cirey was not without interruptions. He often traveled to Paris, and to Versailles, where, through the influence of Jeanne Antoinette Poisson, Marquise de Pompadour (q.v.), the famous mistress of Louis XV, he became a court favorite. He was first appointed historiographer of France, and then a gentleman of the king's bedchamber; finally, in 1746, he was elected to the French Academy (see **INSTITUTE OF FRANCE**). His *Poème de Fontenoy* (1745), describing a battle won by the French over the English during the War of the Austrian Succession (see **SUCCESSION WARS**), and his *Précis du Siècle de Louis XV* ("Epitome of the Age of Louis XV"), in addition to his dramas *La Princesse de Navarre* and *Le Triomphe de Trajan*, were the outcome of Voltaire's connection with the court of Louis XV (q.v.).

Following the death of Madame du Châtelet in 1749, Voltaire finally accepted a long-standing invitation from Frederick II of Prussia to become a permanent resident at the Prussian court; see **FREDERICK II**. He journeyed to Berlin in 1750 but did not remain there more than two years, because his acidulous wit clashed with the king's autocratic temper and led to frequent disputes. While at Berlin he completed his *Siècle de Louis XIV*, a historical study of the period of Louis XIV (1638–1715).

Attacks on Religion. For some years Voltaire led a migratory existence, but finally settled in 1758 at Ferney where he spent the remaining twenty years of his life. In the interval between his return from Berlin and his establishment at

Ferney, he completed his most ambitious work, the *Essai sur l'Histoire Générale et sur les Moeurs et l'Esprit des Nations* ("Essay on General History and on the Customs and the Character of Nations", 1756). In this work, a study of human progress, Voltaire decries supernaturalism and denounces religion and the power of the clergy, although he makes evident his own belief in the existence of God.

After settling in Ferney, Voltaire wrote several philosophical poems such as *Le Désastre de Lisbonne* ("The Lisbon Disaster", 1756); a number of satirical and philosophical novels, of which the most brilliant is *Candide* (1759); the tragedy *Tancrède* (1760); and the *Dictionnaire Philosophique* (1764). Feeling secure in his sequestered retreat, he sent forth hundreds of short squibs and broadsides satirizing abuses that he desired to expose. All men who suffered persecution because of their beliefs found in Voltaire an eloquent and powerful defender. The flavor of Voltaire's activities could be summarized in the phrase he often used: *écrasons l'infâme* ("let us crush the infamous one"). With this phrase, he refers to any form of religion that persecutes nonadherents or that constitutes fanaticism. For Christianity he would substitute deism, a purely rational religion. *Candide*, in which Voltaire analyzes the problem of evil in the world, is a repository of the woes heaped upon the world in the name of religion.

Criticism. Voltaire's contradictions of character were reflected in his writings, as well as in the impressions of others. He seemed able to defend either side in any debate, and to some of his contemporaries he appeared distrustful, avaricious, and sardonic; others considered him generous, enthusiastic, and sentimental. Essentially, he rejected everything irrational and incomprehensible and called upon his contemporaries to act against intolerance, tyranny, and superstition. His morality was founded on a belief in freedom of thought and respect for all men, and he maintained that literature should be useful and concerned with the problems of the day. These views made Voltaire a central figure in the 18th-century philosophical movement typified by the writers of the famous French *Encyclopédie*; see DIDEROT, DENIS; ENCYCLOPEDIA. Because he pleaded for a socially involved type of literature, Voltaire is considered to be a forerunner of the so-called literature of engagement of the 20th century exemplified by the writings of the French philosopher and author Jean-Paul Sartre (q.v.) and other French existentialists; see EXISTENTIALISM.

All of Voltaire's works contain memorable

passages distinguished by elegance, perspicuity, and wit. His poetic and dramatic works, however, are marred often by too great a concentration on historical matter and philosophical propaganda. His other writings include the tragedies *Brutus* (1730), *Zaïre* (1732), *Alzire* (1736), *Mahomet* (1741), and *Mérope* (1743); the philosophical romance *Zadig* (1747); the philosophical poem *Discours sur l'Homme* ("Discourse on Man", 1738); and the historical study *Charles XII* (1730). W.F.

VOLTA REDONDA, city of Brazil, in Rio de Janeiro State, on the Paraíba R., 65 miles N.W. of Rio de Janeiro. A model industrial city founded on the site of an earlier village in 1942, it has the largest steelworks in Latin America. The products of privately owned industrial plants supplement those of the government steel complex that dominates the industry of the city. Pop. (1970) 120,645.

VOLTMETER. See ELECTRIC METERS: *Measurement of Voltage*.

VOLTURNO, river of south-central Italy, rising in the Apennines, E. of Rome, and flowing some 110 miles S., S.E., and W., emptying into the Gulf of Gaeta, about 20 miles N.W. of Naples. The city of Capua is located on the Volturno R. about 19 miles N. of Naples.

VOLUME, amount of space occupied by a solid, liquid, or gaseous substance. Volume is measured in terms of cubic units, such as cubic inches, cubic feet, cubic gallons, or cubic bushels in the English system of weights and measures, and in cubic centimeters or cubic liters in the metric system (q.v.). See WEIGHTS AND MEASURES.

VOLUNTEERS OF AMERICA, nonsectarian philanthropic organization with headquarters in New York City, founded by the American reformers Ballington Booth (see under BOOTH) and his wife Maud Charlesworth Booth (1865–1948) in 1896, and incorporated under the laws of the State of New York. Services include summer camps, maternity homes, day-care services, family services, mission churches, Sunday schools, salvage programs, emergency housing, girls' residences, family and youth centers, Sunset Clubs for the aging, aid to homeless men, children and youth services, aid to prisoners and families, homes for the aged, aid to handicapped workers, and school-clothing programs. The official publication of the society is *The Volunteer*.

VON BRAUN, Wernher (1912–77), German-American engineer, born in Wirsitz, Germany (now Wyrzysk, Poland). He received a B.S. degree from the Berlin Institute of Technology in 1932 and a Ph.D. degree from the University of

Berlin in 1934. Von Braun began experimenting with rockets in his youth. From 1937 to 1945 he was director of the German Rocket Research Center at Peenemünde on the Baltic Sea, in charge of developing the V-II long-range liquid-fuel rocket, used to bombard England during World War II, as well as guided missiles (q.v.); see also **ROCKETRY**. In 1945 he came to the United States as technical adviser to the U.S. rocket program at the White Sands Proving Grounds in New Mexico. In 1950 he was transferred to Huntsville, Ala., where for ten years he headed the Readstone missile program. Von Braun was naturalized a U.S. citizen in 1955.

In 1960 he became director of development operations at the George C. Marshall Space Flight Center of the National Aeronautics and Space Administration (q.v.) in Huntsville. Von Braun was responsible for development of the Saturn V launch vehicle that was used, with the Apollo spacecraft, in the first manned lunar landing in 1969. In 1970 he became a deputy associate director in charge of planning for the U.S. space program. In 1972 he resigned from government service to join private industry. See **ASTRONAUTICS**.

VONDEL, Joost van den (1587–1679), Dutch poet and playwright, born in Cologne, Germany. The outstanding poet of Holland's Golden Age, Vondel experienced persecution as a humanist and Anabaptist. Later in life he converted to Catholicism, then the religion of the majority in Holland. His first play *The Pascha* (1612) and his early lyrics were the result of his study of the classical drama and the *Poetics* of the Greek philosopher Aristotle (q.v.). Some of the lyrics from his dramas are among the finest in the Dutch language. His classical imitations or adaptations, among them *Hecuba* (1625), *Hippolytus* (1628), *Electra* (1638), *King Oedipus* (1660), and *Iphigenia in Taurus* (1666), were accompanied by a parallel series of original tragedies. The tragedies included *Hierusalem Verwoest* ("Jerusalem Laid Waste", 1620), *Lucifer* (1654), *Jephtha* (1659), and *Adam in Ballingschap* ("Adam in Exile", 1664).

VON STROHEIM, Erich (1885?–1957), American motion-picture director, actor, and writer, born in Vienna, Austria, and educated at the military academy in Wiener Neustadt. Von Stroheim immigrated to the United States in 1909 and became an American citizen in 1926. He began his motion-picture career as an actor, appearing in *Intolerance* in 1916. In 1919 he wrote, directed, and starred in *Blind Husbands*, his first directing assignment. He also directed the silent films *Foolish Wives* (1921), *The Merry Widow*

(1925), *The Wedding March* (1927), and the monumental *Greed*, produced in 1924 as a ten-hour epic and later reduced by the studio to less than two hours. *Greed* was based on the novel *McTeague* (1899) by the American writer Frank Norris (see under **NORRIS**). Distinguished by Von Stroheim's meticulous realism in every detail, the film marked a turning point in motion pictures. After the mid-1930's Von Stroheim lived in France. He acted in several sound films, including *La Grande Illusion* (1937), made by the French director Jean Renoir (see under **RENOIR**), and *Five Graves to Cairo* (1943) and *Sunset Boulevard* (1950), both made in the U.S.

VOODOO, or VODUN, or HOODOO, religion of Haiti, also practiced by some Negroes in Cuba, Trinidad, Brazil, and the southern United States, especially Louisiana. Voodoo combines elements of Roman Catholicism and tribal religions of western Africa, particularly Dahomey. Voodoo cults worship a high god, *Bon Dieu*; ancestors or, more generally, the dead; twins; and spirits called loa. The loa, most of which vary from cult to cult, are African tribal gods that are usually identified with Catholic saints. The snake god, for example, is identified with Saint Patrick (q.v.). Other elements of Catholicism in voodoo include the use of candles, bells, crosses, and prayers, and the practices of baptism and the making of the sign of the cross. Among the African elements are dancing, drumming, and the worship of ancestors and twins.

The rituals of voodoo are often led by a priest, called a *hungan*, or priestess, called a *mambo*. During the ritual the worshipers invoke the loa by drumming, dancing, singing, and feasting, and the loa take possession of the dancers. Each dancer then behaves in a manner characteristic of the possessing spirit and while in his ecstatic trance performs cures and gives advice.

VOR, abbreviated term for very high-frequency omnidirectional radio range, a signal range used for electronic navigation by ships and aircraft; see **NAVIGATION**: *Electronic Navigation: Omnidirectional Range*. See also **RADAR**: *Operation*.

VORONEZH, city and port of the Soviet Union, in the Russian S.F.S.R., and capital of Voronezh Oblast, on the Voronezh R., 5 mi. above its confluence with the Don, and about 300 miles s.e. of Moscow. A rail and industrial center, Voronezh has plants producing chemicals, glass, machinery, radios, synthetic rubber, and tractor parts. Among its many educational institutions, in the city are a state university founded in 1918, an agricultural institute founded in 1913, as well as schools of agriculture, engineering, and med-

icine. The city was founded in 1586 as a Russian frontier fortress. During the 17th century Voronezh was an important shipbuilding center. It was the site of heavy Russo-German fighting in July and September, 1942, and in January, 1943. The city was largely destroyed by German troops during World War II (q.v.) and was completely rebuilt after the war. Pop. (1970) 660,000. **VORONOFF, Serge** (1866–1951), Russian-French physiologist and surgeon, born in Voronezh, Russia, and educated at the University of Paris. Voronoff became a naturalized French citizen in 1897. During World War I he was chief surgeon of the Russian Hospital at Paris, and in 1921 he became director of experimental surgery at the Collège de France, Nice. In 1940 Voronoff moved to the United States; in 1945, after World War II, he returned to the Collège de France.

Voronoff was widely recognized as an expert in surgical grafting and for a series of experiments on the grafting of glands and gland tissue that improved the stock of sheep and horses. His later experiments were concerned with attempting sexual rejuvenation in men and improving the mental development of retarded children by transplanting glands from monkeys. Voronoff also was one of the first scientists to point up the relationship between hormonal activity and aging. Several books by Voronoff were published in English translation, including *Rejuvenation by Grafting* (1925), *Conquest of Life* (1928), *From Cretin to Genius* (1941), and *The Sources of Life* (1943).

VOROSHILOV, Kliment Efremovich (1881–1969), Russian military and political leader, born in the Ukraine. A revolutionary in his youth, he was frequently imprisoned by the imperial authorities. In 1918 he was a field commander against the White Russian army during the civil war that followed the Russian Revolution (q.v.); see UNION OF SOVIET SOCIALIST REPUBLICS: *History*. In 1925 Voroshilov was elected a member of the politburo of the central committee of the Communist Party, and from 1925 to 1940 he served as a deputy chairman of the Council of People's Commissars. In June, 1941, Voroshilov was given command of the northern, or Leningrad, front against the advancing Germans during World War II (q.v.); his subsequent military failures cost him this command in October. In 1952 he became a member of the presidium, or executive committee, of the Soviet Union. He served as chairman of the presidium from 1953 to 1960. **VOROSHILOVGRAD**, formerly LUGANSK, city of the Soviet Union, in the Ukrainian S.S.R., on the Lugan R., 10 mi. from its confluence with the Donets R. and about 415 miles S.E. of Kiev. The

city, which is located in a coal-mining region, has plants producing processed foods, locomotives, machine tools, mining equipment, and textiles. The city is the site of a state medical school and an agricultural institute. Voroshilovgrad was founded about 1795 when coal mining was undertaken in the region. During World War II (q.v.) the city was captured by German troops. Pop. (1970) 382,000.

VOSGES, range of mountains in N.E. France; extending about 120 mi. from S. to N., and parallel with the Rhine R. The highest summits in the S. portion of the range rise to more than 4000 ft. above sea level; the N. peaks average about 3000 ft.

VOTING. See BALLOT; ELECTIONS; ELECTORAL COLLEGE; ELECTORAL REFORM; PARLIAMENT; REGISTRATION; SUFFRAGE; WOMAN SUFFRAGE.

VOWEL, in speech, a class of sounds resulting from the more or less unblocked passage of breath through the mouth, and varying according to the shape, size, and condition of the resonance cavities. Vowels are usually voiced sounds. In English the letter symbols representing vowel sounds are a, e, i, o, u, and sometimes y.

VULCAN (Lat. *Volcanus*), in Roman mythology, the god of fire. Originally an old Italian deity who seems to have been associated with volcanic fire, Vulcan was identified with the Greek god Hephaestus (q.v.) in classical times. At Rome his festival, the Volcanalia, was celebrated every August 23, and he was particularly revered at Ostia, where his was the principal cult.

VULCANIZATION. See RUBBER.

VULCANO. See LIPARI ISLANDS.

VULGATE (Lat. *vulgata editio*, "popular edition"), edition of the Latin Bible that was pronounced "authentic" by the Council of Trent; see BIBLE: *Manuscripts, Versions, Editions, and Translations*; TRENT, COUNCIL OF. The name originally was given to the "common edition" of the Septuagint used by the Greek Fathers (see FATHERS OF THE CHURCH). It was then transferred to the Itala or the Old Latin version of both the Old Testament and the New Testament that was used extensively during the first centuries in the Western Church. The present composite Vulgate is basically the work of Saint Jerome (q.v.), a doctor of the Church.

At first St. Jerome used for his Old Testament translation, embracing parts of the Apocrypha, the Greek Septuagint; later he consulted Hebrew texts. He made two revisions of the Psalms (q.v.), called the Roman and the Gallican respectively. The latter, based on a Greek trans-



Lynwood Chace - National Audubon Society

Left: Andean condor, *Vultur gryphus*. Right: Black vulture, *Coragyps atratus*, with trainer.

UPI

literation of a Hebrew text, is now read in the Vulgate. Jerome had previously undertaken, at the request of Pope Damasus I (see under DAMASUS) in 382, a revision of the New Testament. He corrected the Gospels (see GOSPEL) thoroughly and the rest more cursorily with the aid of Greek codices that were then reputed trustworthy.

Through the next twelve centuries, the text of the Vulgate was transmitted with less and less accuracy. The Council of Trent recognized the need for an authentic Latin text and authorized a revision of the currently corrupt editions. This revision is the usual Latin Bible of the contemporary Roman Catholic Church (q.v.). A modern reworking of it has been under way since 1907.

See also BIBLE, ENGLISH TRANSLATIONS OF THE.

VULTURE, common name applied to carrion-eating birds belonging to the families Cathartidae, comprising the American vultures, and Accipitridae, which includes the Old World vultures and the hawk (q.v.). All vultures are large birds with a naked head; a long, down-curving beak; and hooked claws. They feed entirely on carrion and other refuse. Ungainly on the ground, vultures are graceful in flight, soaring in groups at high altitudes to find food. They have remarkably keen vision and hunt largely by sight. The American vultures differ from the Old World group by having longitudinal, perforated nostrils without a partition and no voice, due to the absence of a syrinx.

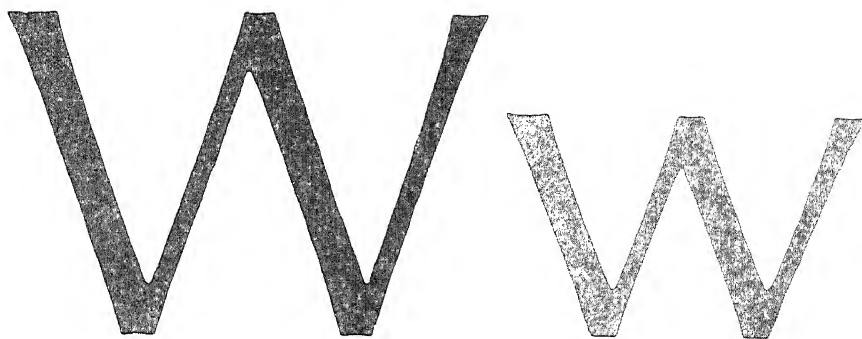
American Vultures. The largest extant flying bird is the South American condor, *Vultur gryphus*, with a wingspread of almost 10 ft. The king vulture, *Sarcophagophaga papia*, a white bird with black wing tips and a gray ruff, ranges in

habitat from southern Mexico to northern Argentina. The American black vulture, *Coragyps atratus*, ranges as far north as the Carolinas; it is about 2 ft. long and has black feathers and a naked, black head. Another larger species, the turkey vulture, or buzzard, *Cathartes aura*, is found as far north as the Canadian border. The largest North American vulture is the California condor, *Gymnogyps californianus*; see CONDOR.

Old World Vultures. The cinereous vulture, *Aegypius monachus*, native to Eurasia, averages about 3½ ft. in length and has black feathers and a pink head. It lives in forests, nesting largely in trees. The griffon vulture, *Gyps fulvus*, is similar in size and range but nests on rocky cliffs or in caves. The smallest Eurasian species is the Egyptian vulture, or Pharaoh's chicken, *Neophron percnopterus*. This bird has a bare yellow face, with feathers completely covering the rest of the head and neck.

VYATKA, river of Europe, rising in the E. part of the Russian S.S.R., in the foothills of the Ural Mts., and flowing some 800 mi. The river flows N.W., S.W., and then S.E., emptying into the Kama R. Its middle course lies in the forested upper Volga region. Kirov (q.v.), an important industrial and transportation center, is on the Vyatka.

VYBORG (Sw. *Viborg*, Finn. *Viipuri*), city of the Soviet Union, in the Russian S.F.S.R., on the Gulf of Finland, about 75 miles N.W. of Leningrad. A rail junction, the city has shipyards, and plants producing electrical equipment, processed foods, and machinery. Founded in the 12th century, Vyborg was taken by Russian troops in 1710. From 1812 to 1940 Vyborg belonged to Finland. In 1940 it was ceded to the Soviet Union. Held by the Axis powers (q.v.) from 1941 to 1944, it was retaken by the Russians in 1944. Pop. (1970) 65,000.



W, twenty-third letter and eighteenth consonant in the English alphabet. The character is a ligature rather than a letter, as is implied by its name, double u. In the earliest known West Saxon manuscripts the sound is represented by uu, a digraph for which the Northumbrian rune **P**, called *wen*, was substituted. This was used until the 13th century, except in Anglo-Norman manuscripts, such as the Domesday Book (q.v.), in which the French scribes used UU for medials, and for initials the capital form VV, which, when ligatured, became the present English W.

In uttering the sound of *w*, as in the word *wit*, the vocal cords are set in vibration, with the lips in position for the *oo* of *pool*, but without the formation of the resonance chamber necessary for a distinct vowel. The sound is thus really a half *ū*, instead of a double *yū*; for this reason the sound of *w* is technically called a labial semi-vowel. The *w* sound stands in the same relation to *ū* as *y* to *ī*.

If the lip movement of *w* is made without vibration of the vocal cords, the result is a voiceless or whispered *w*. This is the sound usually substituted by the English for the initial *wh* of *white* and *whet*; in the United States the initial *wh* is generally pronounced *hw*. The voiceless *w* occurs also in other words after voiceless consonants, as in *sweet* and *twin*.

In the old combination *wr*, the symbol *w* has been preserved, but its sound has been lost, as in the words *wrench*, *wrong*, and *wrist*. The combination *cw* has become *qu*, as in *quoth* from Old English *cwethen*. The *w* is occasionally intrusive, as in *whole* from Old English *hāl*. The intrusive *w* is probably due to analogy, and is useful for distinguishing the word from the homophone *hole*. A final *w* is vocalic, as in *few* and *new*, in which the spellings are survivals from the Old English words *fēawa* and *nīwe*, in which *w* was a consonant. In these cases the consonantal sound has been lost.

As an abbreviation, the capital letter W stands for Wales, Washington, Wednesday, west, and worshipful. The lowercase *w* is the abbreviation for week, weight, wide, and wife. It also is used in nautical log books for wet dew. As a symbol, W denotes the element tungsten (formerly called wolfram) in chemistry, and work in mechanics; lowercase *w* denotes a watt in electricity; the twenty-second or, when J is the tenth, twenty-third in a class, group, or series; and twenty-two or twenty-three as a number or numeral.

M.P.
WAALS, Johannes Diderik van der (1837–1923), Dutch physicist, born in Leiden, and educated at Leiden University. From 1877 to 1907 he was professor of physics at the University of Amsterdam. Van der Waals was interested primarily in thermodynamics; he developed a theory of corresponding states on the continuity of the liquid and gaseous states of matter expressed in the Van der Waals equation. For these discoveries he was awarded the 1910 Nobel Prize in physics. He also studied the attractive forces holding the atoms of molecules together. These are called “Van der Waals forces”, in his honor.

WABASH, city of Indiana, and county seat of Wabash Co., about 39 miles s.w. of Fort Wayne, on the Wabash R. The trade center for the surrounding area where hogs, corn, and wheat are raised, manufactures include clothing, rubber products, electrical equipment, and furniture. Wabash was one of the first cities to have its streets lit by electricity. A boulder marks the site of the signing (1826) of the Treaty of Paradise Springs with the Potawatomi Indians, thus opening the territory to settlement. Founded in 1835, Wabash was incorporated in 1866. Pop. (1960) 12,621; (1970) 13,379.

WABASH, river rising in w. Ohio, flowing s.w. across Indiana, and then turning and delineating the Indiana-Illinois border for 200 mi., and

then flowing into the Ohio R. after a course of 475 mi. The river has a drainage area of more than 33,000 sq.mi. Among its chief tributaries are the White and Tippecanoe rivers.

WAC. See WOMEN IN THE ARMED FORCES.

WACO, city in Texas, and county seat of McLennan Co., on both banks of the Brazos R., about 85 miles S.E. of Fort Worth. It is served by railroad and maintains a municipal airport. The city is the market and shipping center for the surrounding agricultural, dairy, and industrial area, and is also the wholesale and manufacturing center of a twenty-county area. In Waco are plants producing cement, furniture, glass, lumber, rocket fuel, rubber products, and wearing apparel. The city is the site of Baylor University (q.v.), chartered in 1845, and of Paul Quinn College, founded in 1872.

The region of the present city was inhabited until about 1830 by the Huaco, an Indian tribe that was almost completely annihilated in that year by a tribe of Cherokee. The town of Waco was laid out in 1849. The first suspension bridge to span the Brazos R., was built there in 1870, and is still in use, together with several modern bridges. The development of the city as a commercial center dates from the arrival of the first railroad, in 1881. Pop. (1960) 97,808; (1970) 95,326.

WADDELL, George Edward, popularly known as RUBE WADDELL (1876–1914), American professional baseball player, born in Bradford, Pa. Waddell was one of the most gifted left-hand pitchers in baseball history, especially noted for his speed and for his strikeout records. In 1904 while pitching for the Philadelphia club, he struck out 349 batters. A league strikeout record, it was for many years carried incorrectly in the record books and for that reason is today marked as disputed; listed along with Waddell's record is the 348-strikeout total made by Cleveland pitcher Robert Feller (q.v.) in 1946. During his career Waddell pitched for a number of minor league teams and for the Louisville, Chicago, and Pittsburgh teams of the National League and the Saint Louis and Philadelphia teams of the American League. He did his most outstanding work for the Philadelphia team, for which he pitched 250 games between 1902 and 1907, winning 131 and losing 81 for a percentage of .618. In his lifetime he pitched 406 games, winning 193 and losing 140, for a percentage of .580. Waddell was elected to the Baseball Hall of Fame in 1946; see BASEBALL HALL OF FAME AND MUSEUM, NATIONAL.

WAD MEDANI, city in the Sudan, and capital of Blue Nile Province, on the Blue Nile s. of

the confluence of the Rahad R. (Bahr ar-Rahad), 110 miles S.E. of Khartoum. A road hub on a railroad, it is a major cotton-growing and market-gardening center and a cattle market. Cigarettes and retreaded tires are processed, and the surrounding area produces cotton, vegetables, fruits, wheat, corn, barley, and durra sorghum. It is the principal city of the irrigated Gezira region and the headquarters of the Irrigation Service. Nearby are the Gezira Research Farm and, at Barakat, the administrative center of the entire Gezira project. Wad Medani has a teacher-training college for women and a technical school for boys. Pop. (1970) 74,519.

W.A.F. See WOMEN IN THE ARMED FORCES.

WAGADUGU. See OUAGADOUGOU.

WAGES, in economic theory, price paid for labor (q.v.). Wages comprehend all payments compensating individuals for time and effort spent in the production of economic goods and services. The payments include not only wages in the ordinary narrow sense, the earnings, computed generally on an hourly, daily, weekly, or output basis, of manual and clerical workers, but also the weekly, monthly, or annual salaries of professional and supervisory personnel; bonuses gratuitously added to regular earnings; premiums for night or holiday work or for work exceeding stated norms of quantity and quality; fees and retainers for professional services; and even that part of the income of business owners that compensates them for time devoted to business.

Since the 1970's the share of national income (q.v.) going to wages rose to three fourths of the total, an increase from the 1935–68 level of about two thirds (see table below).

TABLE 1

Year	National Income ¹	Compensation to Employees ¹	Employees Share ²	Wage Supplements ¹
1929	86.8	51.1	58.9	.7
1933	40.3	29.5	73.2	.5
1935	57.2	37.3	65.2	.6
1940	81.1	52.1	64.2	2.3
1945	181.5	123.1	67.8	5.6
1950	241.1	154.6	64.1	7.8
1955	331.0	224.5	67.8	13.2
1960	414.5	294.2	71.0	23.4
1965	564.3	393.8	69.8	35.0
1970	800.5	603.9	75.4	61.9
1972	941.8	707.1	75.0	79.7
1973p	1038.2	774.9	74.6	92.6

¹ In billions of dollars

² Percent of National Income

p = preliminary

Source: Bureau of Statistics, U.S. Dept. of Commerce.

Wages may be reckoned at time rates, at piece rates, or at incentive rates. Wage earners on time rates may be docked for days, hours, or even minutes of absence or idleness, but salaried workers usually receive fixed sums for each customary pay period, whether or not they are

continuously on the job. Workers on piece rates are remunerated uniformly for each unit of output. Those receiving incentive wages are paid according to formulas relating output to earnings in ways designed to induce higher production.

A high rate of pay does not assure large annual earnings. Construction workers are paid relatively high hourly rates but their annual income often is low because of the irregularity of their employment. In addition, nominal wages do not reflect real earnings accurately. During a period of inflation (q.v.) the real value of wages may fall although nominal wages rise, because the cost of living (q.v.) rises more rapidly than monetary earnings. Deductions from wages for income taxes, social-security taxes, pension payments, union dues, insurance premiums, and other charges further reduce the worker's take-home pay. See Table 2.

TABLE 2. AVERAGE WEEKLY EARNINGS OF U.S. MANUFACTURING WORKERS

Year	Nominal Earnings	Real Earnings (in terms of 57-59 dollars)
1940	\$ 24.96	\$ 51.15
1945	44.20	70.49
1950	58.32	69.59
1955	75.70	81.14
1960	89.72	87.02
1965	107.53	97.84
1970	133.73	104.71
1973 ¹	169.33	124.97 ²

¹ Projected or provisional figures

² In 1967 dollars

Determining Influences. The influences determining wage levels in particular countries at particular times are as follows. (1) The cost of living. Even in very poor societies wages are usually at least sufficient to pay the cost of sustaining workers and their children, otherwise the working population will not reproduce itself and will decline. (2) The influence of standards of living: Prevailing living standards influence conceptions of what constitutes a so-called living wage, thus helping to determine wage levels. Improvements in general living conditions generate moral pressures for giving laborers a share of the better life. In the presence of such pressures employers are more inclined to grant wage increases and legislators are constrained to approve minimum-wage (q.v.) and other laws designed to ameliorate the worker's lot. This effect is not large. (3) The relative supply of labor: Where labor is scarce relative to capital, land, and other resources, as in 19th-century America, employers' competitive bidding for labor tends to raise the general wage level. Where, as in present-day India, the ratio of labor to other re-

sources is high and where accordingly the supply of labor greatly exceeds demand, competition among laborers for the relatively few available jobs tends to depress the wage level. (4) Productivity: Wages tend to rise with productivity. Productivity depends partly upon the energy and skill of the labor force and even more upon the level of technology employed. American wage levels are high largely because American workers apply skills of a high order to the operation of an unparalleled abundance of the most advanced industrial equipment. (5) Bargaining power: The organization of labor in trade unions and in political associations enhances its relative bargaining power and thus tends to win for organized labor, especially in time of deflation, a larger share of the national income.

General Wage Level. This is an average of widely differing individual pay rates and earnings. The various factors contributing to wage differentiation are as follows. (1) The relative value of product: An industrious and skilled worker who produces a more valuable output than workers of lesser capabilities is worth more to his employer than the others and usually is paid more. (2) The costs of required capabilities: Employers must pay the price of special training if they are to fulfill their need for workers so trained. If engineers did not receive more compensation than laborers, relatively few persons would invest the time, money, and effort required to become an engineer. (3) The relative scarcity of specific kinds of labor: Common labor is paid poorly because it is common, but movie stars and television performers who have qualities regarded as unique enjoy very large incomes. (4) The comparative attractiveness of occupations: Difficult, disagreeable, or dangerous jobs usually bring higher rates of pay than do more inviting jobs requiring comparable skills. For this reason a truck driver engaged in moving explosives earns more than one delivering groceries. (5) The mobility of labor: Where the working population is immobile, wage differentials are wide. On the other hand, the readiness of workers to change jobs or to move long distances to better-paying positions tends to narrow wage differentials among firms, occupations, and communities. (6) Comparative bargaining strength: A union may lift the wages of its members above the scales paid to unorganized workers of equal skill. (7) Custom and legislation: Many wage differentials are rooted in custom or legislation. Both custom and legislation are responsible for the fact that Coloured miners in the Republic of South Africa earn only

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a fraction of the wages paid white miners doing equivalent work. On the other hand, governments and unions act frequently to eliminate wage differentials based on race, sex, and other economic irrelevancies and to standardize wages generally.

Theories of Wages. Most wage theories reflect overemphasis on one or another of the factors determining wages. The first noteworthy wage theory, the just-wage doctrine of the Italian Scholastic philosopher Saint Thomas Aquinas, emphasizes moral considerations and the role of custom. A just wage is defined as that which enables the recipient to live in a manner suited to his social position. Aquinas' theory is a view of what wages should be rather than an explanation of what they actually are.

The first modern explanation of wages, the so-called subsistence theory, emphasized the consumption needed to sustain life and maintain the working population as the chief determinant of wage levels. The theory was adumbrated by mercantilist economists, elaborated by the British economist Adam Smith, and developed fully by the British economist David Ricardo on premises derived from the population theory of the British economist Thomas Robert Malthus; see *MERCANTILE SYSTEM*. Ricardo argued that wages are determined by the cost of barely sustaining laborers and their replacements and that wages cannot long depart from the subsistence level. If earnings should fall below that level, he contended, the labor force would not reproduce itself; if earnings should rise above it, more working-class children than the number needed to replenish the labor force would survive and wages again would be forced down to subsistence levels by the competition of laborers for the available jobs.

The assumptions of the subsistence theory were invalidated by the facts of subsequent economic history. In advanced countries, the output of food and other consumer goods increased more rapidly than population during the later 19th and 20th centuries, and wages accordingly rose well above bare subsistence levels.

The wage theory of the German revolutionist Karl Marx is a variant of Ricardo's theory. He argued that under capitalism labor seldom receives more than bare subsistence. According to Marx, the surplus remaining is appropriated by the capitalists as their profits. Like Ricardo's theory, Marx' view was nullified by subsequent economic experience.

After the decline of the subsistence theory attention shifted to demand for labor as a wage

determinant. The British economists Nassau William Senior and John Stuart Mill, among others, propounded the so-called wages-fund theory to explain how the demand for labor, as expressed in the money employers have available to pay for labor, influences wages. The theory rests on the assumption that all wages are paid out of past accumulations of capital and that the average wage rate is determined by dividing the share set aside for wages by the number of employed workers. Wage increases for some workers could only mean reductions for others. Only by augmenting the wages fund or by reducing the number of laborers could the wage level be raised.

The wages-fund theorists were mistaken in assuming that wages are paid out of past capital accumulations. Wages actually are paid mainly out of current production. Wage increases, by strengthening buying power, may stimulate production and generate additional wage-paying potential, especially if there are unemployed resources.

The wages-fund theory was succeeded by the marginal-productivity theory, which was concerned mainly with the influence exerted by the demand and supply of labor. Proponents of the theory, which was developed largely by the American economist John Bates Clark (1847–1938), maintained that wages tend to be set at the point at which employers find it profitable to engage the last job-seeking worker, who is called the marginal worker. Because, by the principle of diminishing returns, the value of each additional worker's contribution to production is supposed to diminish, growth of the labor force would tend to depress wages. If wages should rise above the level assuring full employment, part of the labor force would become unemployed; if wages should fall below that level, competitive bidding by employers for the additional workers would push wages up again.

The marginal-productivity theory is defective in assuming perfect competition and in ignoring the effect of wage increases on productivity and on buying power. As the British economist John Maynard Keynes, one of the most vigorous critics of the theory, demonstrated, wage increases may bolster an economy's propensity to consume rather than to save; expanded consumption creates new demands for labor in spite of the higher wages that must be paid, if higher incomes can arise out of decreased unemployment.

Economists extensively revised the marginal-productivity theory of wages in the 20th cen-

tury. In its modified form it was, in mid-century the most widely held of wage theories. One of the principal revisions was based on the theories of imperfect and monopolistic competition published in the early 1930's by the British economist Joan Robinson (1903–) and the American economist Edward H. Chamberlin (d. 1967). Their hypotheses made it possible to reformulate the marginal-productivity theory in terms closer to actual conditions and to discard the unrealistic assumptions of pure competition and perfect mobility.

Most economists recognized, with Keynes, that higher wages need not cause reduced employment. A more serious danger that can result from wage increases is inflation, for employers are inclined to raise prices to compensate for large wage outlays. This danger can be averted only if wages are not allowed to outrun productivity. Because labor's share of the national income has been virtually constant and is likely to remain so, real wages can rise mainly to the degree that productivity rises.

History of Wages. Few records exist of the wage scales that prevailed before the 19th century. The little evidence available indicates that the vast majority of workers seldom earned more than bare subsistence pay. Both prices and wages began to rise in the 15th century, but wages frequently failed to rise to as high a level as prices. About 1850 the tide turned in favor of labor, at least in western Europe and in the United States. Despite temporary setbacks, real wages of workers in all advanced countries generally advanced after 1850 mainly as a result of the increasing productivity which came from the application of scientific knowledge to processes of production.

In the U.S. the enormous growth of productivity led to a general rise in real wages, although the rise was not steady. From the last quarter of the 18th century to about 1820 wage increases nearly kept pace with price rises, so that real wages remained fairly constant. Real wages doubled in value between 1820 and 1890, remained static from 1890 to 1914, and began to advance rapidly after 1914. Real weekly earnings increased by about 150 percent between 1914 and 1954; 23 percent between 1955 and 1958; and over 43 percent between 1960 and 1973.

Developments after World War II enhanced the average worker's economic position, sometimes in ways not discernible in the pay envelope. The amendment (1955) of the Fair Labor Standards Act of 1938 (q.v.) raised the minimum wage to \$1.00 per hour. Further adjustments brought this to \$1.60 by 1969. Provisions in many

collective-bargaining agreements correlated wage rates to the cost of living, thus assuring that real wages would not lag behind nominal wages. Under a union-sponsored guaranteed-annual-wage plan the automobile industry agreed (1956) to pay wages, to the workers covered, during periods of unemployment. Employers increasingly adopted the practice of paying for holidays, vacation time, sick leave, coffee breaks, and other periods during which no work is performed. Most collective-bargaining agreements provide for numerous so-called fringe benefits, including provision that employers bear the cost of establishing union pension funds and of insuring the workers against various contingencies. Finally, many employers have added a great many extra benefits to regular compensation, including free meals, free use of recreational facilities, subsidized medical and psychotherapeutic treatments, subsidized education and training, shares of profit, and options to buy company stock at bargain prices. Wage supplements have risen from 0.8 percent to about 8.9 percent of National Income from 1929 to 1973; see Table 1.

See also separate articles for those individuals whose birth and death dates are not given.

K.E.B.

WAGNALLS, Adam Willis (1843–1924), American publisher, born in Lithopolis, Ohio. After studying for the ministry at Wittenberg College (now Wittenberg University), Wagnalls served as pastor of the first English-speaking Lutheran church in Kansas City, Mo., from 1867 to 1869. In 1870 he moved to Atchison, Kans.; he served as city clerk there from 1871 to 1873. In 1876 he joined his college classmate, the American publisher and editor Isaac Kauffman Funk (q.v.), in New York City; they formed a partnership, Funk & Wagnalls, in 1877 that in 1891 became Funk & Wagnalls Company. The firm published *A Standard Dictionary of the English Language* (1894, 1903), the periodical *Literary Digest* (founded in 1890), and *The Jewish Encyclopedia* (12 vol., 1901–06). The partners also published an encyclopedia from which the *Funk & Wagnalls New Encyclopedia* was derived.

WAGNER, Honus, known as HANS WAGNER (1874–1955), American professional baseball player, born in Mansfield (now Carnegie), Pa. He played semiprofessional and minor-league baseball in Ohio and New Jersey, and in 1896 he joined the Louisville, Ky., team of the National League. In 1900 Pittsburgh, Pa., took Louisville's place in the league, and Wagner played shortstop for the Pittsburgh Pirates until his retirement in 1917. Nicknamed the "Flying Dutch-

man", he is generally considered the greatest shortstop in the history of baseball. He was the National League batting champion eight times, the last in 1911, and his lifetime batting average was .329. He also led the league five times in stolen bases. Wagner was elected to the Baseball Hall of Fame in 1936; see BASEBALL HALL OF FAME AND MUSEUM, NATIONAL.

WAGNER, Richard, in full WILHELM RICHARD WAGNER (1813–83), German composer, musical theorist, and originator of the music drama, born in Leipzig, and educated at the University of Leipzig. In 1833 he became master of the chorus at the opera house in Würzburg. Thereafter he was conductor at the opera houses of Magdeburg (1834–36), Königsberg (1836), and Riga (1837–39). During these years he wrote the operas *Die Feen* ("The Fairies", 1833) and *Das Liebesverbot* ("The Forbidden Love", 1836); the overtures *König Enzo* ("King Enzo", 1832), *Christopher Columbus* (1835), *Rule Britannia* (1836), and *Polonia* (1836); seven songs for the drama *Faust* by the German poet Johann Wolfgang von Goethe (q.v.); and the Symphony in C major (1832). In 1836, while at Königsberg, Wagner married the actress Minna Planer (1809–66). At Riga he completed the libretto and the first two acts of his first important opera *Rienzi*, based on the novel of the same name by the British writer Edward George Earle Lytton Bulwer-Lytton (see under LYTTON).

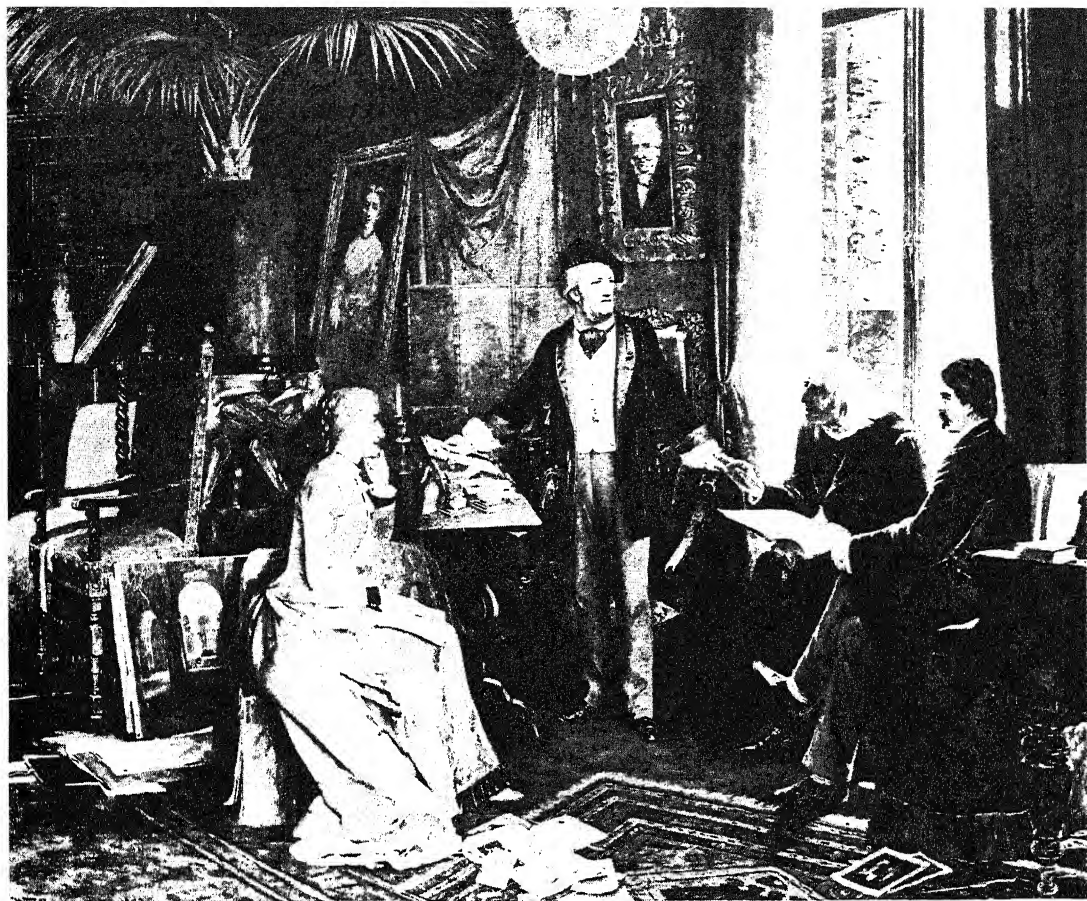
In 1839 Wagner sailed from Pillau, East Prussia, to London, England, accompanied by his wife. During the tempestuous voyage across the North Sea, he conceived the idea for his second major opera, *Der Fliegende Holländer* ("The Flying Dutchman", completed in 1841). After eight days in London, he traveled to France, settling eventually in Paris; he remained there until April, 1842, at times reduced to the direst poverty. The first version of *Eine Faust Ouvertüre* ("A Faust Overture") was finished in 1840 (revised 1855). Somewhat later, Wagner submitted the score of *Rienzi* to the Court Theater at Dresden, Germany, where it was produced on Oct. 20, 1842. The success of *Rienzi* led to the production of *Der Fliegende Holländer* at Dresden on Jan. 2, 1843. In the same month Wagner moved to Dresden, where he became one of the conductors at the Court Theater.

Innovative Art. Wagner's Romantic opera *Tannhäuser* was produced at Dresden on Oct. 19, 1845; see TANNHÄUSER. This work, with innovations in structure and technique, perplexed audiences accustomed to the conventional opera of the day and elicited a storm of adverse criticism. Nevertheless, *Tannhäuser* was pro-

duced at Weimar, Germany, three years later by the Hungarian composer Franz Liszt (q.v.), who afterward became an enthusiastic proponent of Wagnerian music drama. The meeting of Liszt and Wagner in 1848 resulted in a lifelong friendship. In the same year the Romantic opera *Lohengrin* was completed, but the management of the Court Theater at Dresden, apprehensive of public and critical reaction to another work by the composer of *Tannhäuser*, declined to produce it; see LOHENGRIN. Liszt once more came to the rescue and produced *Lohengrin* at Weimar on Aug. 28, 1850.

A Political Radical. Wagner was an extreme radical in politics. He participated in the abortive Revolution of 1848 (q.v.) in Germany and, in consequence, was obliged to flee from his homeland, first to Paris, and then to Zürich, Switzerland. There he amplified the sketches, previously begun, for his famous tetralogy of music dramas, known collectively as the *Ring des Nibelungen*, and based upon the 12th-century Middle High German epic poem of the *Nibelungenlied* (q.v.). The texts of the *Nibelung* dramas were written in reverse order. Finding that certain narrative episodes in *Götterdämmerung* ("The Twilight of the Gods"), the final work of the tetralogy, required elaboration and dramatic exposition to make the story altogether comprehensible, Wagner wrote the third part, *Siegfried*. Still not satisfied, however, he wrote *Die Walküre* ("The Valkyries") and, as a further explanatory prelude, *Das Rheingold* ("The Rheingold"). Wagner began work on the score of *Das Rheingold* in November, 1853, completing it in May of the following year. By the end of December, 1856, the score of *Die Walküre* was finished.

Meanwhile, in 1852, Wagner had made the acquaintance of the wealthy merchant Otto Wesendonk and his wife Mathilde. The former placed at the disposal of Wagner and Minna a small cottage, the *Asyl* (Ger., "Asylum"), on the Wesendonk estate near Zürich; this situation furnished the composer with the inspiration for some of his finest music. Close association between Wagner and Mathilde soon developed into love, which they were forced to renounce. Their romance eventually found expression, however, in Wagner's passionate score of *Tristan und Isolde* (1857–59), which is one of the longest and the most difficult to produce of all the Wagnerian music dramas. It was given its first performance on June 10, 1865, at Munich, under the auspices of Louis II (Ludwig in German), King of Bavaria (see under LOUIS), who had become Wagner's patron.



An 1882 portrait of (left to right) Cosima Wagner; her husband, Richard Wagner; her father, Franz Liszt; and a friend, Herr von Wilzogen. The artist is W. Beckmann.

In 1861 the political ban against Wagner was lifted. Upon his return to Prussia the composer settled in Biebrich, where he began work on his only comic opera, *Die Meistersinger von Nürnberg*, completed in 1867. The work was produced on June 21, 1868, at Munich, where in 1879 and 1870 *Das Rheingold* and *Die Walküre* also were given by command of the king.

Immediately after the production of *Die Meistersinger* Wagner resumed work on the score of *Siegfried*, completing it in February, 1871. At the same time he began the composition of *Götterdämmerung*. Meanwhile, on Aug. 25, 1870, the composer, who had been separated from his first wife for nine years, married Cosima von Bülow (1837-1930), the divorced wife of the pianist and conductor Hans Guido von Bülow (q.v.) and the daughter of Liszt. In the summer of 1872, Wagner composed the last part of the *Ring des Nibelungen*, and by November, 1874, orchestration of *Götterdämmerung* had been completed. On Aug. 13, 14, 15, and 17, 1876, the premier performance of the whole tetralogy took place at the Festspielhaus, a theater in Bayreuth designed and constructed especially for the presentation of Wagnerian music dra-

mas. In 1877 Wagner began work on *Parsifal*, based on legends of the Holy Grail. The last of the Wagnerian music dramas, *Parsifal* was completed in January, 1882, and was produced for the first time on July 26, 1882.

In 1882 the composer's health began to fail. Thinking he might benefit from a change of climate, Wagner rented the Palazzo Vendramin on the Grand Canal in Venice; he died there suddenly on February 13 of the following year. Five days later his body was interred in the mausoleum of his Bayreuth villa.

Other Works. Wagner wrote a song cycle, *Fünf Gedichte von Mathilde Wesendonk* ("Five Poems by Mathilde Wesendonk", 1857-58), consisting of "Der Engel" ("The Angel"), "Träume" ("Dreams"), "Schmerzen" ("Sorrows"), "Stehe Still" ("Rest Tranquil"), and "Im Treibhaus" ("In the Greenhouse"); and the orchestral work *Siegfried Idyll* (1870), composed for his wife Cosima. The theoretical and critical writings of Wagner include *On German Music* (1840), *The Art Work of the Future* (1849), *Judaism in Music* (1850),

Opera and Drama (1850–51), *The Music of the Future* (1860), *Religion and Art* (1880), *On Conducting* (1869), *On the Application of Music to the Drama* (1879), and *A Communication to My Friends* (1851). Wagner also wrote an autobiography, *Mein Leben* ("My Life", 1865–80).

Criticism. Wagner's reputation is based upon his musical creations, which represent the highest expression of Romanticism (q.v.) in European music and also upon the revolution he effected in both the theory and practice of operatic composition. He began his career as a composer of operas in the conventional manner, but by the time he started work on the *Ring des Nibelungen* he was creating an entirely new musico-dramatic form. The true line of development of the Wagnerian music drama is from Greek drama through the dramas of William Shakespeare and the German poet Johann Christoph Friedrich von Schiller (qq.v.). On the purely musical side its lineal evolution is from the German composers Johann Sebastian Bach through Ludwig van Beethoven (qq.v.). A fundamental principle of the music drama is the subservience of all the arts involved, including music, to the dramatic needs of the story. By means of the leitmotiv, or leading motive, a continuous thematic development is achieved. This thematic development is absent from the pre-Wagnerian opera, which, lacking the dynamic and unifying principle of the leitmotiv, is little more than a static succession of stereotyped arias, recitatives, duets, interludes, and finales, each formally complete in itself. The reform effected in traditional opera is not due to any direct, intentional effort on the part of Wagner, but rather to the tremendous influence of his art on every form of music.

See also MUSIC: *The Romantic Era*; OPERA: *Romantic Period*. J.V.

WAGNER, Robert Ferdinand (1877–1953), American lawyer and legislator, born in Nastätten, Germany. He came to the United States with his parents in 1885, and graduated from the City College of the City of New York (now part of the City University of New York) in 1898. He was admitted to the bar in 1900. From 1904 to 1908 Wagner was a member of the New York State assembly, and from 1908 to 1918 he occupied a seat in the State senate. In 1918 he became a justice of the New York State supreme court. A member of the Democratic Party (q.v.), Wagner was elected to the United States Senate in 1926 and served there until his retirement in 1949. He was a leader in the field of housing legislation and the sponsor of important laws passed during the era of the New Deal (q.v.), in-

cluding the National Industrial Recovery Act (q.v.) in 1933, the National Labor Relations Act (q.v.), known as the Wagner Act, and the Social Security Act in 1935 (see SOCIAL SECURITY).

His son, Robert Ferdinand Wagner, Jr. (1910–), a graduate of Yale University, also became a lawyer and a Democratic politician. He was borough president of Manhattan (1949–53) and mayor of New York City (1954–65). He also was U.S. ambassador to Spain (1968–69). Upon his return to the U.S., he entered private law practice.

WAGNER ACT. See NATIONAL LABOR RELATIONS ACT.

WAGNER VON JAUREGG, Julius or **WAGNER-JAUREGG, Julius** (1857–1940), Austrian psychiatrist, born in Wels and educated at the University of Vienna. He taught psychiatry and neurology at the universities of Vienna and Graz. He was awarded the 1927 Nobel Prize in medicine and physiology for his successful treatment of general paresis, or syphilitic paralysis, by infecting the patient with malaria. He also introduced the treatment of cretinism with thyroid-gland preparations and of goiter with iodine.

WAGTAIL, common name for numerous birds of the Motacillidae family. The genus *Motacilla*, the true wagtails, includes about 45 species, of which 8 are European. They frequent open and well-cultivated districts, where they are found on banks of streams and ponds and in pastures. They are almost exclusively terrestrial in habits. The pied wagtail, *M. alba yarrellii*, is from about 7 to 8 in. long and has beautifully marked white and black plumage. The white wagtail, *M. alba alba*, and the yellow wagtail, *M. flava*, are the only wagtails recorded in the New World.

WAHHABIS, in Islam, members of a puritanical reform movement begun by the conservative Syrian jurist Mohammed ibn-'Abd-al-Wahhab (1703–93). Ibn-'Abd-al-Wahhab was faithful to the Koran (q.v.), the supreme body of Islamic law, and to the Hadith (or Sunna), a second body of Islamic law comprising the actions and utterances attributed to the Prophet Muhammad (q.v.), the founder of Islam. He rejected, however, all innovations, and also the principle of consensus (Ijma) of the Muslim community on any text of Islamic writ and on customs compatible with the Koran or Hadith; see ISLAM: *Islamic Law: Consensus (Ijma)*.

The ascetic life and stern preaching of ibn-'Abd-al-Wahhab extended the influence of the Wahhabis, who also rejected all luxury, dancing, gambling, music, and the use of tobacco. Subsequently, Wahhabism spread rapidly as a nation-

alist religious movement, gaining eventual ascendancy throughout Arabia (q.v.). Wahhabi warriors successfully attacked and purged the Islamic shrine at Karbala' and the cities of Riyadh, Mecca, and Medina in the early years of the 19th century before they were defeated by the armies of the Turkish sultan Mahmud II, after a campaign ending in 1818. The number of Wahhabis today exceeds 3,000,000, but they are confined almost entirely to the Arabian Peninsula, in the kingdom of Saudi Arabia (q.v.). See ARABIA: *History*.

WAINWRIGHT, Jonathan Mayhew (1883–1953), United States Army officer, born in Walla Walla, Wash., and educated at the U.S. Military Academy at West Point, N.Y. During World War I (q.v.) he served in France, and took part in the offensive at Saint-Mihiel; see SAINT-MIHIEL, BATTLE OF. In 1940 he was sent to the Philippines as a major general. In March, 1942, during World War II (q.v.), Wainwright assumed the Philippine command when the American general Douglas MacArthur (q.v.) was dispatched to aid in the defense of Australia (see AUSTRALIA: *History*). After defending Bataan Peninsula and Corregidor Island (qq.v.) against heavy odds, Wainwright surrendered to the Japanese on May 6, 1942. He remained a prisoner of war until 1945 when he was rescued in Manchuria. He was made a general in 1945 and became commander of the Fourth Army in 1946. Wainwright retired in 1947.

WAITE, Morrison Remick (1816–88), American jurist, born in Old Lyme, Conn., and educated at Yale University. He was admitted to the bar in Ohio in 1838 and became active in local politics as a member of the Republican Party. In 1871 he was United States counsel at a Geneva convention of five nations held to arbitrate the Alabama claims (q.v.). During the convention Waite successfully established the liability of Great Britain in permitting the construction and outfitting of Confederate ships in British ports during the American Civil War (see CIVIL WAR, THE AMERICAN). In 1874 President Ulysses Simpson Grant (q.v.) appointed Waite chief justice of the United States Supreme Court, a post he held until his death. In his decisions Waite tended to restrict Federal authority and to uphold the powers of the States. He delivered his most famous opinion in the case of *Munn vs. Illinois* (1877), in which he upheld legislation that had been urged by the grangers to regulate railroad and grain elevator rates, declaring that businesses affecting the public interest must be controlled for the sake of the common welfare; see GRANGER MOVEMENT.

WAKAYAMA, city and port in Japan, and capital of Wakayama Prefecture, on Honshu Island, on Kii Channel, about 40 miles s.w. of Osaka. The commercial center for the surrounding agricultural and lumbering region, Wakayama also has plants producing chemicals, machinery, and textiles. Pop. (1970) 365,000.

WAKE. See MORTUARY CUSTOMS: *Treatment of the Corpse*.

WAKEFIELD, town of Massachusetts, in Middlesex Co., about 10 miles n. of Boston. Among the principal manufactures are apparel, chemicals, electrical equipment, furniture, lumber, machinery, and wood products. Notable buildings in the town include the Hartshorne House, built in 1663, and containing colonial furnishings. The site of the present town was first settled in 1639. Until 1812 it was part of Reading; in that year it was separately incorporated as South Reading, and in 1868 it received its present name in honor of Cyrus Wakefield (1811–73), who established the world's first rattan factory here. Pop. (1960) 24,295; (1970) 25,402.

WAKEFIELD, Great Britain, county borough of England, and administrative center of West Riding, Yorkshire, on the Calder R., 10 miles e. of Leeds. A center of the cloth industry since the 14th century, Wakefield also has plants producing chemicals, tools, and woollens. Wakefield was the site of the Yorkist defeat in the Wars of the Roses in 1460; see ROSES, WARS OF THE. Pop. (1971) 59,650.

WAKE ISLAND, coral atoll in the central Pacific Ocean, administered by the United States, about 2400 miles w. of Hawaii and about 1600 miles n.e. of Guam. It is a group of three islets (Wake, Peale, and Wilkes) which enclose a shallow lagoon. Discovered in 1796, Wake Island was formally occupied by the U.S. in 1898. In 1934 Wake was placed under the jurisdiction of the United States Navy Department, and in 1935 Pan American World Airways established a base on the atoll to serve its clipper planes on their flights between the U.S. and the Orient. During 1939 Congress appropriated special funds for the construction of a naval air base and a submarine base on Wake. The island, since World War II, is under the jurisdiction of the Department of the Interior.

On Dec. 7, 1941, during World War II, immediately after the Japanese surprise attack on Pearl Harbor, Japanese air and naval forces attacked Wake Island. For a period of two weeks the island garrison consisting of about 400 United States Marines under the command of Major James Patrick Sinnot Devereux (1903–) and aided by about 1000 civilians employed in

WAKE-ROBIN

strengthening the atoll's defenses, fought off a combined air and naval attack. The defense of Wake Island against overwhelming odds is one of the most heroic achievements in American military history. On December 23 the epic resistance of the Marines ended with the capture of Wake. The flag was again raised over Wake Island in September, 1945, following the Japanese surrender in World War II. Devereux and the survivors were freed after the close of the war. Area, 3 sq.mi.; pop. (1970) 1647.

See *WORLD WAR II: The War Develops Into A Global Conflict: The Japanese Attack*.

WAKE-ROBIN. See *TRILLIUM*.

WAKSMAN, Selman Abraham (1888-1973), American microbiologist, born in Priluki, Russia. He emigrated to the United States in 1910 and became an American citizen in 1916. He was



Selman Abraham Waksman

Chas. Pfizer & Co., Inc.

educated at Rutgers University and the University of California. He joined the faculty of Rutgers University in 1918; in 1958 he was named professor emeritus of microbiology and director emeritus of the Institute of Microbiology, of which he had been director since its creation in 1949. Waksman also served as marine bacteriologist at Woods Hole Oceanographic Institution, in Massachusetts, from 1930 to 1942; as microbiologist at the New Jersey Agricultural Experiment Station from 1921 to 1954; and as consultant to several Federal agencies.

Waksman started research into soil microorganisms at an early age and his experiments on antibacterial molds resulted in the announcement of the discovery in 1944 of streptomycin (q.v.), to which he was the first to apply the term "antibiotic" (q.v.). For this discovery, he was

awarded the 1952 Nobel Prize in medicine or physiology. Streptomycin is used in combating such diseases as tuberculosis and whooping cough, and infections of the urinary tract. Waksman also discovered and developed several other antibiotic agents, isolated from microorganisms; see *BACTERIA*; *CHEMOTHERAPY*; *GRAM'S METHOD*. Waksman wrote over twenty books, including *Enzymes* (1926), *Principles of Soil Microbiology* (1927), and *My Life with the Microbes* (1954), and about 400 scientific papers.

WALACHIA. See *RUMANIA: History*.

WALBURGA, Saint or WALPURGA, Saint or WALPURGIS, Saint (710?-77), English Roman Catholic missionary, born in Sussex. She was the sister of the English missionary Saint Willibald (700?-86), and was summoned to Germany in about 748 by the English Benedictine missionary Saint Boniface (q.v.). In 754 she became abbess of the Benedictine religious house in Heidenheim. Her feast day is usually celebrated on May 1, and the preceding night, formerly the date of a pagan festival marking the beginning of summer, is known as Walpurgis Night.

WALCHEREN, region of the Netherlands, in Zeeland Province, between the Eastern Scheldt and Western Scheldt rivers, and bordered on the w. by the North Sea. Formerly an island, but now linked with North Beveland, this fertile region is protected from the sea by dunes and dikes. The chief occupation is producing vegetables for Dutch and British markets. Middelburg (pop. 1972 est., 32,552), the provincial capital, and Flushing (41,814) are the chief towns. Walcheren was partially flooded in 1944, during World War II, when the dikes were bombed. Area, about 80 sq.mi.; pop. (1972 est.) 94,922.

WALD, George (1906-), American biochemist, born in New York City, and educated at New York and Columbia universities. In 1934 he joined the faculty of Harvard University, becoming a full professor of biology in 1948. Wald shared the 1967 Nobel Prize in medicine or physiology with the Swedish neurophysiologist Ragnar Granit and the American biophysicist Haldan Keffer Hartline (qq.v.). The three scientists were cited for their individual research into the physiology of vision. Wald demonstrated the reaction to light of the substance rhodopsin in the retinal rods.

WALD, Lillian D. (1867-1940), American nurse and social worker, born in Cincinnati, Ohio, and trained as a nurse at The New York Hospital, in New York City. In 1893 she founded the Henry Street Settlement for social work, which she later expanded to include a public-health nursing center. She took a leading part in promoting

the establishment of the United States Children's Bureau in 1912. Miss Wald was the author of *The House on Henry Street* (1915).

WALDEN, pond of Massachusetts, in Middlesex Co., near Concord. It was made famous by the American author Henry David Thoreau (q.v.), who built a cabin on its shore and lived there alone from 1845 to 1847. He described his experiment in self-reliance in a series of essays entitled *Walden, or Life in the Woods* (1854).

See also TRANSCENDENTALISM.

WALDENSES, or VALDENSES or VAUDOIS, members of a Christian sect. It grew out of a movement against the ecclesiastical establishment that was originated by a wealthy French merchant, Peter Waldo (d. 1217), of Lyon, in the second half of the 12th century. His followers were known as the "poor men of Lyon". Itinerant preachers under a vow of poverty, they taught a type of religion that has been erroneously associated with the teachings of the Cathari (q.v.). Their simple, Bible-based preaching proved more popular, however, than the more complex teachings of the Cathari. The archbishop of Lyon vainly forbade them to preach. They were later excommunicated and were persecuted along with the Albigenses (q.v.) in southern France. The Waldenses spread through Europe, but a conspicuous group settled in secluded areas in the Cottian Alps, a range that now marks the border between France and Italy. The areas are still known today as the Waldensian Valleys.

After the Albigenses were crushed, the Waldenses became the victims of the Inquisition (q.v.) in France. In 1487 Pope Innocent VIII (1432–92) organized a crusade against them in Dauphiné and Savoy (both now part of France). Many Waldenses took refuge in Switzerland and Germany, merging gradually with the Bohemian Brethren (q.v.). The group became openly Calvinistic during the Reformation; see CALVINISM; REFORMATION. In 1535 they paid for the publication, in Switzerland, of the first French Protestant version of the Bible; it was prepared by a French Calvinist scholar, Pierre Robert Olivétan (1506?–38).

Persecution was renewed in Piedmont in the middle of the 17th century, and the Waldenses did not achieve full civil and religious liberty in Italy until 1848, under the Sardinian king Charles Albert (1798–1849). In 1855 they founded a school of theology in Torre Pellice, in the province of Turin, their headquarters in modern times. The school was moved to Florence in 1860 and thence, in 1922, to Rome.

The Waldenses have about 150 organized

churches throughout Italy with some 30,000 members. In South America about 24,000 Waldenses are organized into churches in Argentina and Uruguay.

Early colonies of Waldensian refugees were established in Delaware and on Staten Island (now part of New York) in the 17th century. A new wave of immigrants in the late 19th century resulted in the foundation of several Waldensian congregations in the United States, including those of New York City; Chicago; Val-dese, N.C.; and Monett, Mo. By the early 1970's most of these had merged with the Presbyterian Church, forming Waldensian Presbyterian congregations.

WALDHEIM, Kurt (1918–), Austrian diplomat, born near Vienna and educated at the Diplomatic Academy and the University of Vienna. He joined the Austrian consular service in 1945, and his first foreign assignment was as first secretary in the embassy at Paris from 1948 until 1951. He held high posts in the ministry of foreign affairs in Vienna from 1951 until 1955 and again from 1960 until 1964; he was minister and then ambassador to Canada from 1956 to 1960.

From 1968 until 1970 Waldheim was Austrian foreign minister. As the candidate of the conservative People's Party he was defeated for the Austrian presidency in 1971. But his long career at the United Nations (q.v.), which began with the admission of Austria to membership in 1958, was climaxed by his election late in 1971 to a five-year term as secretary-general. He succeeded the retiring secretary-general, the Burmese diplomat U Thant (q.v.). Waldheim, regarded as a highly skilled diplomat, expert at maintaining the status quo, is also an author. His *Der Österreichische Weg* (1972; Eng. trans., *The Austrian Example*, 1973) cites the return of his native land to peace and prosperity.

WALDO, Peter. See WALDENSES.

WALDSEEMÜLLER, Martin or WALTZEMÜLLER, Martin (1470?–1522?), German cartographer, born in Freiburg. In 1507 he produced a large map of the world, a small globe, and an accompanying treatise, *Cosmographiæ Introductio*. The treatise contains an account of the voyages of the Italian navigator Amerigo Vespucci (q.v.), and in the three works the name America was applied for the first time to the newly discovered transatlantic lands. Waldseemüller's *Carta Marina* (1516) is another large-scale representation of the world and contains important corrections and improvements. All copies of both maps had been lost for centuries, until in 1901 a single copy of each was discovered in a castle in Württemberg.

WALES

WALES, part of the United Kingdom of Great Britain and Northern Ireland, forming administratively a part of England and occupying a broad peninsula on the w. side of the island of Great Britain. Wales includes also the island of Anglesey (q.v.), which is separated from the mainland by the narrow Menai Strait. Wales is bounded on the n. by the Irish Sea, on the e. by the English counties of Cheshire, Shropshire, and Hertfordshire, and the border county of Monmouthshire, on the s. by Bristol Channel, and on the w. by Saint George's Channel and Cardigan Bay. It extends approximately between lat. 51°24' N. and lat. 53°25' N. and long. 2°42' W. and long. 5°20' W. The maximum n.-s. extent of the Welsh mainland is 136 mi.; in an e.-w. direction the distance varies between 36 mi. and 96 mi. For some statistical and administrative purposes Monmouthshire is regarded as part of Wales. Including Monmouthshire, the total area of Wales is 8016 sq.mi.

THE LAND

Wales has an irregular coastline with many bays, the largest of which is Cardigan Bay. Except for the low coastal region, Wales is almost entirely mountainous. The principal range is the Cam-

brian Mts. which extend n. and s. through central Wales. The Snowdon massif, in n.w. Wales w. of the Cambrian Mts., reaches an elevation of 3560 ft., the greatest in England and Wales. The Dee R., which rises in Bala Lake and flows 70 mi. through Wales and England, is the principal river. In the s. numerous rivers flow through steep valleys, including the Usk and Wye.

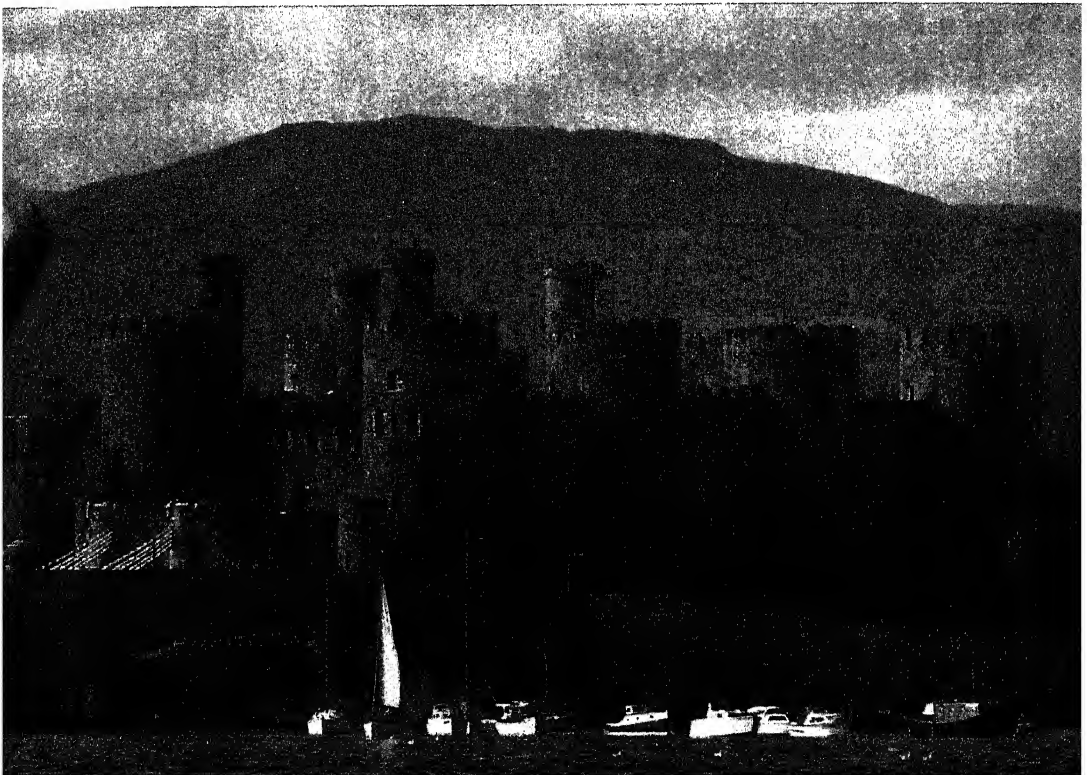
Climate. The climate of Wales, like that of England, is mild and moist. The average daily temperatures in July and January are about 60° F. and 42° F., respectively. Annual rainfall varies with altitude, ranging from about 30 in. in certain coastal regions to more than 100 in. in the Snowdon massif.

Natural Resources. Coal is the most valuable mineral resource of Wales. Some high-grade anthracite is found, but output consists principally of bituminous coal. Manganese, gold, lead, uranium, copper, zinc, slate, and fireclays are also found. Much of the soil of Wales is of infertile rocky or leached types. The most fertile soils are in the s.e. and in a few coastal areas. Some electricity is generated by waterpower.

Plants and Animals. Most plant and animal life is similar to that of England (see ENGLAND: *The Land: Plants and Animals*). Wales has abundant ferns and mosses in low-lying, wet areas. Wooded areas, including stands of mountain

Conway Castle, in Caernarvon, northwestern Wales, was built in the 13th century. It was the birthplace of Edward II.

John Lewis Stage-Photo Researchers





Aberdaron, in Caernarvonshire, is a typical small town on the northwestern coast of Wales.

Adam Woolfitt-Woodfin Camp

ash, oak, and various coniferous species, are extensive up to about 1000 ft. elevation. At higher altitudes chiefly small shrubs, coarse grasses, and alpine flora subsist. Among the few animals found in Wales but not in England are the pine marten and the polecat.

THE PEOPLE

The people of Wales, as those of Great Britain in general, are descendants of varied racial stocks, including Celts, Scandinavians, and Romans. Because the land is generally poor, Wales has a predominantly industrial society.

Population. According to the latest official census (1971) the population of Wales, including Monmouthshire, was 2,723,596. The population density (1971) was approximately 339.7 persons per sq.mi. Approximately 75 percent of the population is concentrated in the mining centers in the southern region of Wales.

Political Divisions and Principal Cities. Wales comprises thirteen administrative counties, as follows: Anglesey, Breconshire, Caernarvonshire, Cardiganshire, Carmarthenshire, Denbighshire, Flintshire, Glamorganshire, Merionethshire, Monmouthshire, Montgomeryshire, Pembrokeshire, and Radnorshire.

The major cities of Wales are Cardiff (pop. 1971, 278,221), principal seaport and ship-building center; Swansea (172,566), a seaport and center of the tin-plate industry; Newport (112,048), an industrial center; and Rhondda

(88,924), chief city of the Welsh coal-mining region.

Religion. The Church of England was the established church of Wales and England until 1920, when it was disestablished in Wales and Monmouthshire. The Welsh branch of the Church of England is the faith of about 165,000 Welshmen. The next largest religious body, with nearly 140,000 adherents, is the Calvinistic Methodist church, known as the Presbyterian Church of Wales.

Language. English is the official language and is spoken by most of the population. A small percentage of the people speaks Welsh only; more than 30 percent speak both Welsh and English (see **WELSH LANGUAGE**).

Education. The educational system of Wales is similar to that of England, except that in some districts instruction is given in Welsh, and English is taught as a second language. See **ENGLAND: The People: Education**.

The only institution of higher education is the University of Wales, founded in 1893. The university is composed of the University College of Wales, in Aberystwyth; the University College of North Wales, in Bangor; the University College of South Wales and Monmouthshire, in Cardiff; the University College of Swansea; and the



Like their ancestors, a band of Welshmen still fish the River Teifi in lightweight coracles made of leather or pitch-covered canvas over a wicker frame. BOAC

Welsh National School of Medicine, in Cardiff. In the late 1960's the University of Wales had more than 12,500 students annually.

Culture. Somewhat isolated in their mountainous section of Great Britain, the Welsh have retained more of the culture of their Celtic forebears than have either the Scots or the English. A strong feeling of national solidarity exists in Wales, and a nationalist revival has received some political support, evidenced by representatives of the Welsh Nationalist Party in Parliament.

The Welsh are perhaps best known for their love of singing, and their hymns and folk songs are widely known. Music plays a large part in the annual festival, the Royal National Eisteddfod, at which poetry reading and Welsh folk arts are also featured (see EISTEDDFOD). The Eisteddfod is held each year in a different locality, and Welshmen and those of Welsh descent from all over the world attend.

LIBRARIES AND MUSEUMS. Principal libraries include the National Library of Wales, in Aberystwyth, and the Library of the National Museum of Wales, in Cardiff. Among the principal museums are the National Museum and the Museum of Welsh Antiquities of the University College of North Wales, in Bangor.

ART AND MUSIC. Like most rural countries, Wales has had a few famous painters. Augustus John (1879–1961) is the only world-famous Welsh artist.

Until recent years conditions and opportunities for musical composition, in the modern sense, did not exist in Wales. The long and rich folk tradition, however, has been maintained throughout the rural districts especially, and, since 1906, the Welsh Folk Song Society has done valuable work in collecting and publishing this material. Choral singing, stemming from the religious revival of the late 18th century, is an extremely popular and characteristic part of Welsh musical life. Traditional instruments, especially the harp, are still played. Local and national music festivals play an important role in the cultural life of the region.

THE ECONOMY

Mining is the chief economic activity of Wales and the largest single source of employment. The economy is largely integrated into that of Great Britain, particularly England (see GREAT BRITAIN: *The Economy*).

Agriculture, Forestry, and Fishing. In general the raising of livestock, mainly beef and dairy cattle and sheep, is more important than crop cultivation. Less than 10 percent of the land is under cultivation, and about 40 percent is in grazing land. Forests cover only about 4 percent of the land, but government reforestation programs are gradually increasing the area. The fishing industry is concentrated along the Bristol Channel.

Mining. Coal is the most valuable mineral resource of Wales. The main coal field is in the s. counties of Carmarthenshire, Glamorganshire, and Monmouthshire. The mines of Wales produce about 10 percent of the total coal output of Great Britain. Limestone and slate are also mined.

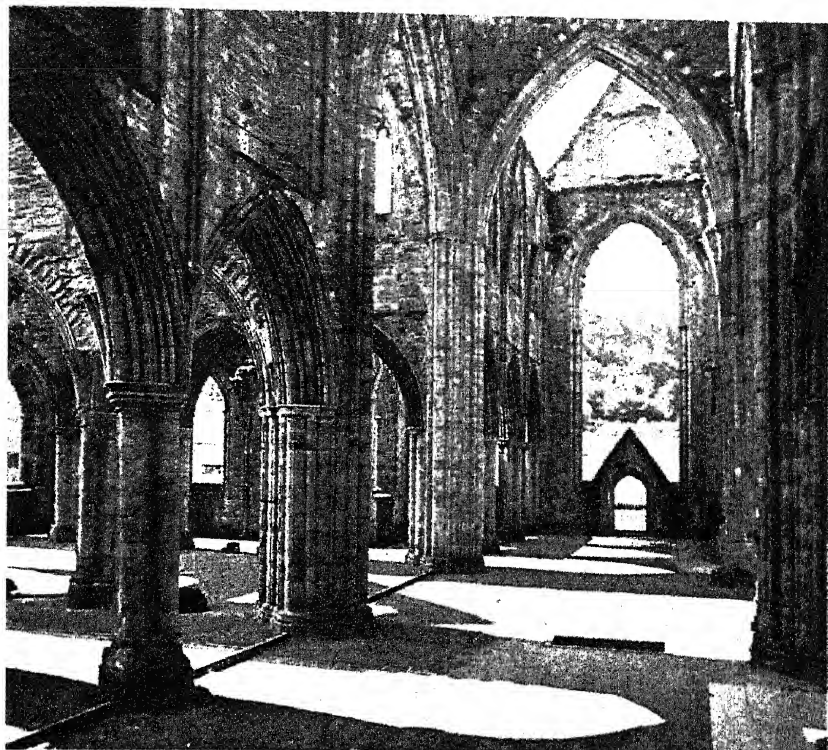
Manufacturing. The refining of metal ore, much of which is imported, is the major manufacturing industry. Almost all the tin plate and most of the sheet steel produced in Britain is made in the Welsh plants. Since World War II many new industries have been established. These include the manufacture of plastics, electronics, synthetic fibers, and automotive parts, and oil refining.

Government. Wales is governed as an integral part of England; for the governmental system, see GREAT BRITAIN: *Government*. The secretary of state for Wales is responsible for matters relating specifically to Wales.

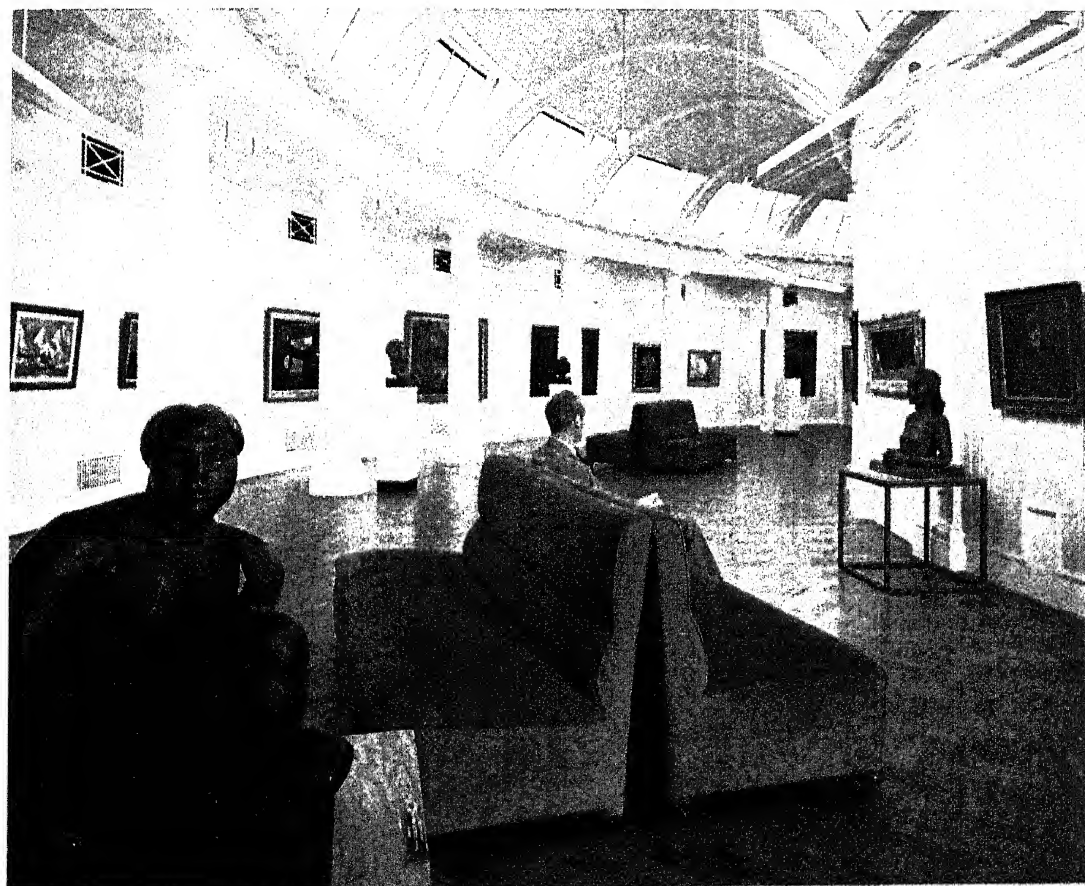
HISTORY

The earliest inhabitants of Wales, as of the rest of Britain, were a short, dark race, generally referred to as Iberians (q.v.). These were succeeded by Celts, possibly first of the Gaelic division, although in the earliest historic times

Wales. Plate 1. Right: The still-solid walls and columns of Tintern Abbey in Monmouthshire served as the inspiration for a poem by the British Romantic poet William Wordsworth in 1798. Below: A curved gallery in the National Museum of Wales in Cardiff, Glamorganshire. The museum houses valuable collections of art, rare silver, and china.



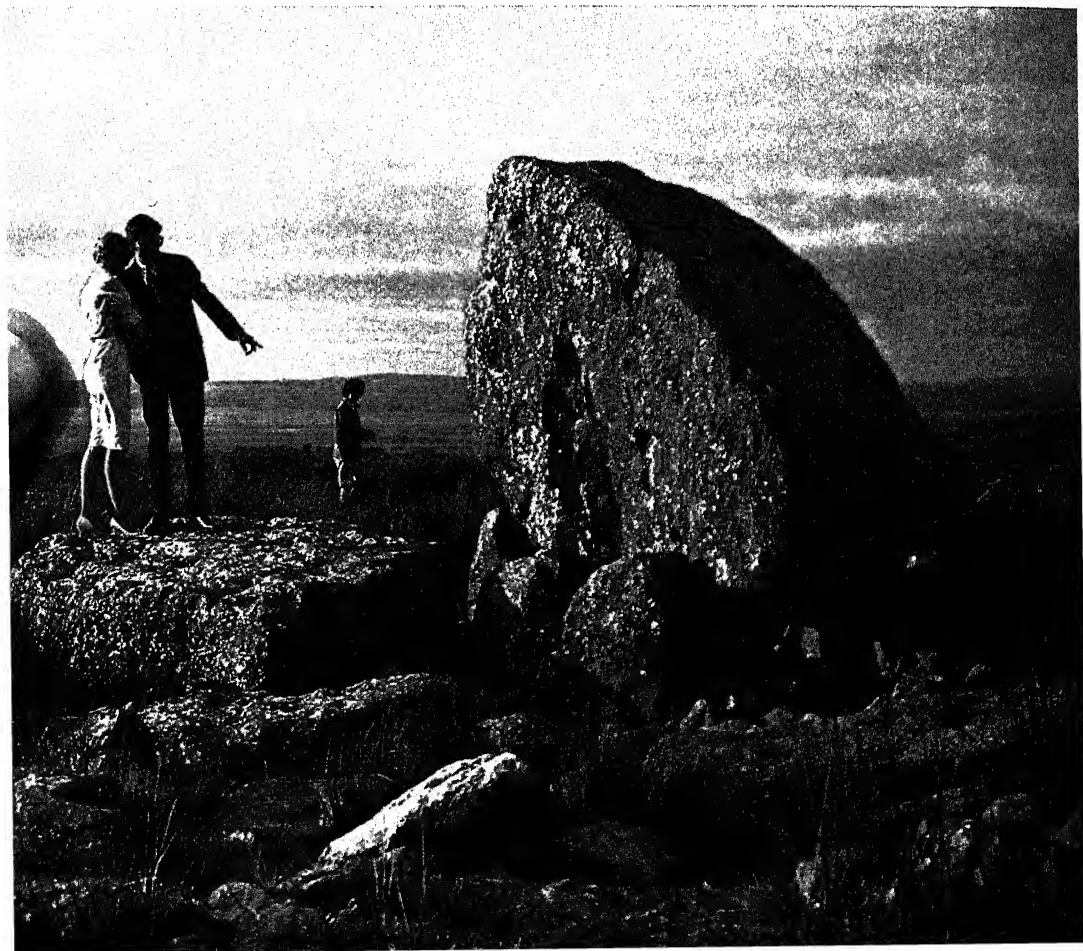
British Travel Association, Wales





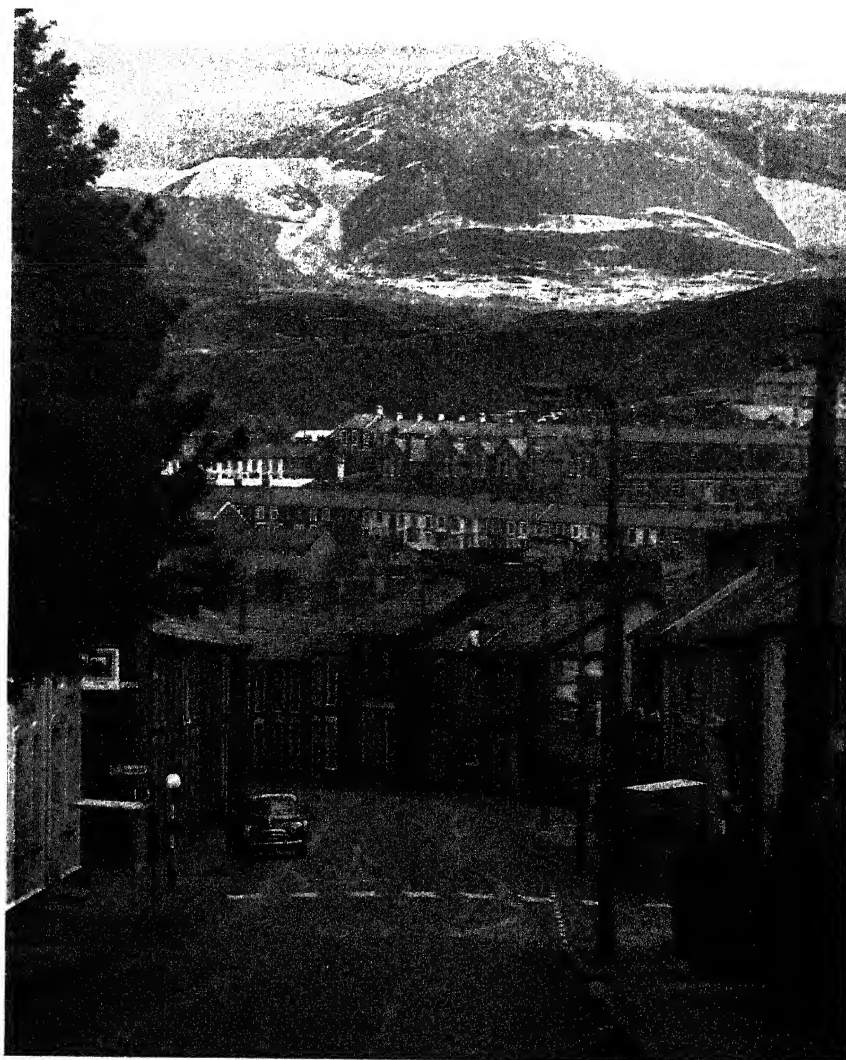
Wales. Plate 2. Above, left: A brilliant plot of tulips enlivens the springtime lawns and the beautifully landscaped grounds of the Civic Centre at Colwyn Bay, a popular seaside resort in Denbighshire. Above, right: A substantial, and traditionally British, afternoon tea is served in Radnorshire. Below: Visitors examine the dolmen known as "King Arthur's Stone" on the Gower Peninsula of Glamorganshire.

British Travel Association, Wales



The coal-mining town of Trealaw in Rhondda Valley, South Wales. Coal is the major mineral resource of Wales, whose two principal fields have produced some 15,000,000 tons annually in recent years.

Alan Band Associates



Wales, like Britain, was occupied by Cymric or Brythonic Celts. At the time of the coming of the Romans, 55 B.C., the tribes of Wales represented a mixture of the primitive Iberians with the later invading Celts. They bore the general name of Cymry. See BRITAIN; CELTIC PEOPLES AND LANGUAGES.

After a long struggle the subjugation of these tribes was completed during the reign (69–79 A.D.) of the Roman emperor Vespasian (q.v.). The Celtic inhabitants of Britain, fleeing before the wave of Anglo-Saxon invasion, took refuge in the Welsh mountains, where, in time, they were merged with their native kinsmen and maintained their independence against the Teuton conquerors. The country was divided into several states, of which Gwynedd, Gwent, Dyfed, and Powys were the most important.

In 1062–64 Harold II (q.v.) overran Wales with an English army after a struggle with Gruffydd

ab Llewellyn, King of Gwynedd (1039–63). William I (q.v.), King of England, called the Conqueror, forced recognition of his sovereignty from the Welsh princes, but they raided the English border, for protection of which the early Norman kings erected a number of feudal lordships with very extensive powers, the so-called lords of the marches. The marcher lords were a turbulent class and a source of trouble to the kings, but they served their purpose in holding the Welsh back. In 1136 the Welsh won a victory over Henry I, King of England, but were again reduced to homage by Henry II (qq.v.). Llewellyn ab Gruffydd, Prince of North Wales (d. 1282), sided with Simon de Montfort against Henry III (qq.v.), but later submitted to the king. In 1273, however, he refused to pay homage to the new English king, Edward I (q.v.), who in 1276 invaded Wales and compelled Llewellyn to submit to humiliating terms, including the sur-

WALES, PRINCE OF

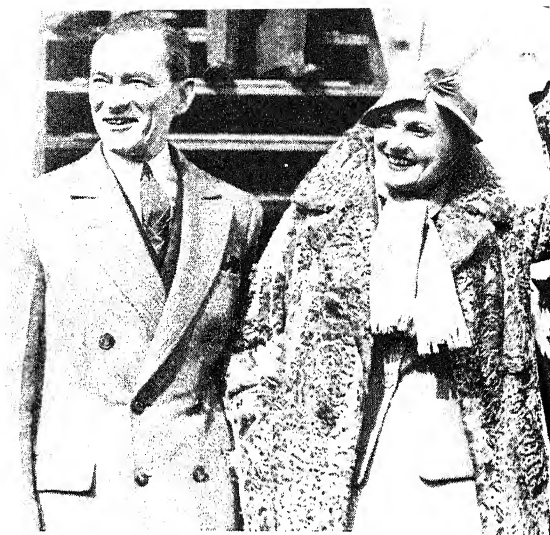
render of the eastern portion of his lands and the annual acknowledgment of fealty. Llewellyn rebelled in 1282, but died, and his brother David III (d. 1283), who carried on the struggle, was captured in 1283 and beheaded. In 1284 Edward I completed the conquest of Wales and, by the terms of the Statute of Rhuddlan, it became an English principality.

In 1301 Edward I conferred on his second son, later Edward II (q.v.), King of England, born in Caernarvon, Wales, the title of prince of Wales and this sufficiently satisfied the pride of the Welsh to keep them loyal for a hundred years. The national spirit survived, however, and was nourished by the songs of the bards. Upon the seizure of the English throne by Henry IV (q.v.) a revolt began in Wales, which, under the leadership of Owen Glendower (q.v.), in 1402, became formidable. Henry IV repeatedly invaded the country, but the revolt was not suppressed till the death of Glendower, about 1416. The Welsh submitted to Henry IV, whom they regarded as their countryman. Glendower's was the last national uprising. In 1536 Wales was incorporated with England, its inhabitants receiving all the rights and privileges of English subjects. For the subsequent history of Wales, see ENGLAND: *History*; GREAT BRITAIN: *History*.

WALES, PRINCE OF. See WALES: *History*.

WALKER, James John, popularly known as JIMMY WALKER (1881–1946), American politician, born in New York City. He was admitted to the New York bar in 1912. A member of the Democratic Party, he was elected to the New York State Senate in 1915, becoming minority leader six years later. In 1925 he was elected mayor of New York City and reelected in 1929. Subsequently, an investigating committee of the State legislature charged Walker with improper financial conduct, and he resigned as mayor on Sept. 1, 1932. Noted for his charm and colorful style, Walker was enormously popular with the electorate; he is remembered as a flamboyant representative of the era of the 1920's.

WALKER, Mary Edwards (1832–1919), American physician and feminist, born in Oswego, N.Y., and educated at the Syracuse Medical College. During the American Civil War she was commissioned as an assistant surgeon in the Union army, becoming the first woman to hold such a commission. She was later decorated for services performed on the field. Subsequently she practiced medicine in Washington, D.C. Miss Walker was a lifelong advocate of women's rights and lectured widely on behalf of woman suffrage (q.v.), dress reform, and the abolition of capital punishment (q.v.).



Jimmy Walker and his wife in 1931.

UPI

WALKER, William (1824–60), American adventurer and filibuster, born in Nashville, Tenn., and educated at the University of Nashville. He earned a medical degree from the University of Pennsylvania in 1843, and following legal studies, he was admitted to the bar in New Orleans, La. In 1850 Walker went to Marysville, Calif., and in 1853 he led an armed expedition in an invasion of Baja California, Mexico. He proclaimed himself president of an independent republic comprising Baja California and the adjoining Mexican State of Sonora. He was forced to surrender to United States authorities because he lacked supplies. In 1854 he was tried and then acquitted of the charge of violating neutrality laws.

When a Nicaraguan revolutionary faction requested Walker's assistance, he led in 1855 a group of followers in the capture of Granada. In 1856 Walker was inaugurated as president of Nicaragua, and his regime was officially recognized by the U.S. government. He planned to unite the Central American republics under his rule. In 1857, however, his forces were defeated in battle by an insurgent army financed by the American industrialist Cornelius Vanderbilt (see under VANDERBILT), whose Accessory Transit Company had been appropriated by Walker and his supporters.

Walker was returned to the U.S., and later in 1857 he was again forced to surrender to U.S. officials following an unsuccessful attempt to recapture Nicaragua. A number of similar efforts also failed. Landing in Honduras in 1860, Walker was captured by the British and tried and executed by the Honduran authorities. He was the author of *The War in Nicaragua* (1860).

See also FILIBUSTERING EXPEDITIONS.

WALKIE-TALKIE, portable two-way radio (q.v.) device, powered by batteries, used chiefly for mobile or field intercommunications by the military, police, and construction and other personnel. First developed in the United States during World War II, it consists of both a sender and a receiver and has a retractable antenna, and usually a range of up to 10 mi. Early walkie-talkie units were carried as back packs and had long whip antennae, but smaller and transistorized models were developed, and today most of them are of pocket size; see TRANSISTOR.

WALKING LEAF. See LEAF INSECT.

WALKING STICK, insect belonging to the Phasmatidae family of the order Orthoptera (q.v.), and so named because of its close resemblance

climates, where some species are known to grow to a length exceeding 1 ft.

WALLABY. See KANGAROO.

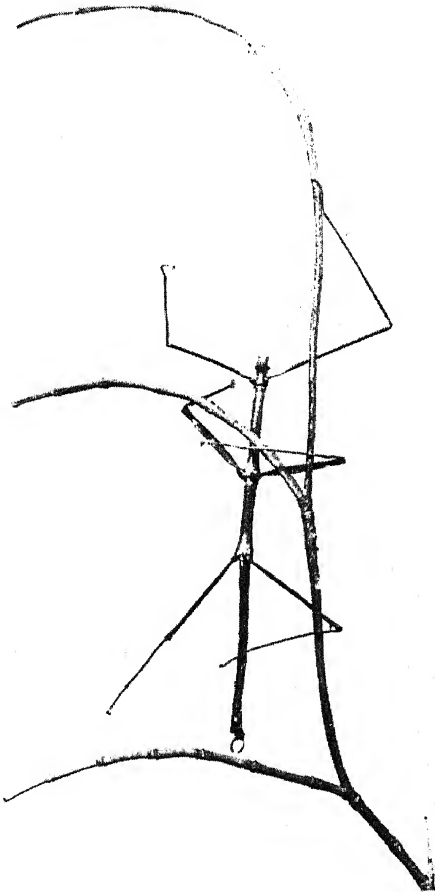
WALLACE, name of a family of American agriculturists and public servants, including the following.

Henry Wallace (1836–1916), editor and writer on agriculture, born in West Newton, Pa., and educated at Jefferson College (now Washington and Jefferson College) and at Allegheny Theological Seminary (now Pittsburgh Theological Seminary). Ordained a Presbyterian minister in 1863, he gave up the ministry in 1877 because of ill health and became a contributor to and editor of various periodicals. In 1895 he bought the journal *Farm and Dairy*, changing the name to *Wallace's Farm and Dairy*; later it became *Wallace's Farmer*. He was editor of this highly influential agricultural publication, which contained sermons as well as farm news, until his death. Wallace also served on various national and Presidential commissions dealing with farm problems.

Henry Cantwell Wallace (1866–1924), editor and writer on agriculture and public official, the son of Henry, born in Rock Island, Ill., and educated at Iowa State Agricultural College (now Iowa State University of Science and Technology). He joined his father in publishing *Wallace's Farmer* in 1895, serving as editor of the journal from 1916 until his death. He was also United States secretary of agriculture from 1921 to 1924, in the cabinets of Presidents Warren Gamiel Harding and Calvin Coolidge (qq.v.).

Henry Agard Wallace (1888–1965), thirty-third Vice-President of the United States, agriculturist, and editor, the son of Henry Cantwell, born in Adair County, Iowa, and educated at Iowa State Agricultural College. He joined his father and grandfather on the staff of *Wallace's Farmer* in 1910, served as editor from 1924 to 1929, and was editor of the successor journal *Iowa Homestead and Wallace's Farmer* from 1929 to 1933. During this time he also did research on corn yields and developed a corn hybrid with a high yield for feeding pigs.

Originally a member of the Republican Party (q.v.), Wallace supported Franklin Delano Roosevelt (q.v.), the Democratic Party (q.v.) candidate, in his bid for the Presidency in 1932. Wallace served as Roosevelt's secretary of agriculture from 1933 to 1940. As secretary he formulated the reforms incorporated in the Agricultural Adjustment Act, designed to raise farm prices; see AGRICULTURE: *Agriculture in the United States: Price-Support Measures*; NEW DEAL.



Walking stick, family Phasmatidae, on twig.

Hal H. Harrison - National Audubon Society

to the twigs of the plants on which most species live. The body is long and slender, the legs are also twiglike, and the wings are sometimes absent, sometimes rudimentary, and sometimes leaflike. The insects are found mostly in tropical

WALLACE, ALFRED RUSSEL

Wallace was Vice-President under President Roosevelt from 1941 to 1945 and secretary of commerce from 1945 to 1946 in the cabinets of Presidents Roosevelt and Harry S. Truman (q.v.). Truman demanded and received Wallace's resignation from the cabinet after the secretary delivered a speech castigating American foreign policy, especially the hard-line policy toward the Soviet Union. He then served as editor of the *New Republic*, a liberal weekly magazine, from 1946 to 1948.

Because of disagreement with the foreign policy platform of both major parties and disaffection with the Democratic Party on the part of many of its liberal members, in 1948 Wallace sought the Presidential nomination of the newly formed Progressive Party (q.v.); he received 1,157,172 votes.

Wallace was the author of many works on agricultural experimentation, sociology, and foreign affairs. His books include *Toward World Peace* (1948), *Corn and the Midwestern Farmer* (1956), *The Long Look Ahead* (1960), and the posthumously published *New Frontiers* (1969). **WALLACE, Alfred Russel** (1823–1913), British naturalist, born in Monmouthshire, England. In 1848 he made an expedition to the Amazon R. with the British naturalist Henry Walter Bates (q.v.), and from 1854 to 1862 he conducted researches in the islands of Malaysia. During the latter expedition Wallace noted fundamental zoological differences between the animal species of Asia and those of Australia, and he placed the zoological dividing line, still known as Wallace's Line, between the Malay islands of Borneo and Celebes. In the course of this research he formulated his theory of natural selection (q.v.), and a striking coincidence was re-

vealed in 1858, when he communicated his ideas to the British naturalist Charles Robert Darwin (see under DARWIN), whose own similar theory of evolution (q.v.) was then in manuscript. Excerpts from the manuscripts of both scientists were issued in a joint publication in July, 1858, and Wallace's contribution was titled "On the Tendency of Varieties to Depart Indefinitely from the Original Type". His works include *Contributions to the Theory of Natural Selection* (1870), and *The Geographical Distribution of Animals* (1876).

WALLACE, DeWitt (1889–), American magazine editor and publisher, born in Saint Paul, Minn., and educated at Macalester College in St. Paul (1907–09) and at the University of California in Berkeley (1910–11). For three years he sold agricultural textbooks for the Webb Publishing Company in St. Paul. He enlisted in the Army during World War I, volunteered for overseas duty, and was seriously wounded in the battle for Verdun. In 1922, after years of planning, he published with his wife, Lila Bell Acheson Wallace (1889–), the first issue (5000 copies) of *Reader's Digest* in New York City. The new pocket-sized periodical consisted of articles digested from general magazines. It has since become the world's most widely circulated periodical, having today a total distribution of more than 17,750,000 copies for its domestic edition and 11,500,000 copies for its seventeen foreign editions (twelve in foreign languages). Editorial headquarters are in Pleasantville, N.Y.

WALLACE, George Corley (1919–), American politician, born in Clio, Ala., and educated at the University of Alabama. After serving in such Alabama State offices as assistant attorney general, member of the legislature, and judge of



George Corley Wallace at a news conference in 1967 during his first campaign for the Presidency.

UPI

the Third Judicial Circuit, Wallace was elected governor. He served from 1964 until 1966, when he was succeeded by his wife, Lurleen Burns Wallace (1926–68); in 1970 Wallace was again elected governor. Meanwhile, in 1968, he sought the Presidency as candidate of the American Independent Party; he founded the party to give the voters an opportunity to support his plan to return to what he considered the fundamental values: respect for law and order and freedom from excessive Federal control. Wallace and his Vice-Presidential candidate, a retired major general of the United States Air Force, Curtis Emerson LeMay (1906–), received 13.5 percent of the popular vote and forty-six electoral votes from five Southern States.

In 1972 Wallace campaigned for the Democratic Party Presidential nomination. On May 15, when he had already won primary elections in several States, he was shot while campaigning in Laurel, Md., by an itinerant American laborer, Arthur Herman Bremer (1931–). Wallace, partially paralyzed as a result of the shooting, received 385.7 votes for the nomination at the convention in July. In 1974 he was reelected governor of Alabama.

WALLACE, Lewis, known as LEW WALLACE (1827–1905), American military leader and writer, born in Brookville, Ind. His law studies were interrupted by the Mexican War, in which he served during 1846–47 as an officer with a volunteer regiment. During the American Civil War Wallace served in the Union army and reached the rank of major general. At the close of the war he presided over several military courts of inquiry and was a member of the court that tried those accused of conspiring to assassinate President Abraham Lincoln (q.v.). He served as governor of the Territory of New Mexico (1878–81) and as minister to Turkey (1881–85). His novel *Ben Hur: A Tale of the Christ* (1880) won him a worldwide reputation. A play and two motion pictures have been based on the book. Wallace's other novels are *The Fair God* (1873) and *The Prince of India* (1893).

WALLACE, Sir William (1272?–1305), Scottish national hero. The only source of information concerning his early life is a 15th-century biographical poem by the Scottish poet Henry the Minstrel (fl. 1470–92), who was known as Blind Harry. According to this work Wallace was outlawed by the English because of a quarrel that resulted in the death of an Englishman. He subsequently burned an English garrison and led an attack upon the English justiciar, an officer for the king, at Scone, Scotland. In 1297 his name appeared in a treaty of submission to England

that was signed by the Scottish nobles who took part in his rebellion. Wallace captured many English fortresses north of the Forth R., and on Sept. 11, 1297, in the Battle of Stirling Bridge, he inflicted a severe defeat on English forces attempting to cross the Forth. He was then elected to the office of guardian of the kingdom. In 1298 Scotland was invaded by a large English force led by the English king Edward I (q.v.). On July 22, 1298, Edward defeated Wallace's army in the Battle of Falkirk, and Wallace was forced into hiding. He lived in France for a time, but returned and was captured near Glasgow by the Scottish knight Sir John de Menteith (d. after 1329). He was brought to London, tried for treason, and executed.

WALLACH, Eli (1915–), American actor, born in New York City and educated at the University of Texas and the College of the City of New York (now City University of New York). He made his professional acting debut on the New York stage in *Skydrift* (1945). He also appeared in *The Teahouse of the August Moon* (1955), *Luv* (1964), and *Waltz of the Toreadors* (1973). In the two last-named productions he appeared with his wife, the American actress Anne Jackson. His motion-picture debut in *Baby Doll* (1956) was followed by roles in such films as *The Magnificent Seven* (1960), and *Zigzag* (1970).

WALLACH, Otto (1847–1931), German chemist, born in Königsberg (now Kaliningrad, U.S.S.R.) and educated at the universities of Göttingen and Bonn. He taught at the University of Bonn from 1870, becoming professor of chemistry in 1876. He became professor of chemistry at the University of Göttingen in 1889 and the director of the chemical institute there in 1899. He was awarded the 1910 Nobel Prize in chemistry for research on the composition of aromatic compounds, including menthol, camphor, and other essential oils and perfumes and spices; see ESSENTIAL OIL. His studies also laid the foundation for later research into sex hormones and vitamins; see HORMONES; VITAMIN.

WALLASEY, Great Britain, county borough of Cheshire, England, on the Mersey R., about 5 miles s.w. of Liverpool. The chief wealth of the borough derives from its inclusion in the port of Liverpool and the production of metal goods and textiles. Pop. (1971) 97,061.

WALLAWALLA, North American Indian tribe of the Shahaptian (q.v.) linguistic stock. The tribe formerly occupied territory along the lower Walla Walla R. and the east bank of the Columbia R. south of its junction with the Snake R. Their language is a separate dialect, similar to

WALLA WALLA

the language of the Nez Percé (q.v.) tribe. In 1805 they were visited by the Lewis and Clark expedition (q.v.). In 1855 the Wallawalla were removed by treaty to the Umatilla Indian Reservation in Oregon, where they have become largely integrated with the Nez Percé, Umatilla, and Cayuse tribes (qq.v.). In 1968 the population at this reservation was 980.

WALLA WALLA, city in Washington, and county seat of Walla Walla Co., about 5 miles N. of the border with Oregon, and about 125 miles s.w. of Spokane. It is served by railroad and maintains a municipal airport. The city is the chief retail and wholesale agricultural center for the surrounding region, which includes s.e. Washington and n.e. Oregon, and which produces fruits, vegetables, livestock, and poultry. Industries in the city include printing, publishing, and the production of processed foods and concrete products.

Walla Walla is the site of Whitman College, founded in 1859; nearby is Walla Walla College, founded in 1892, and Whitman Mission National Historic Site (q.v.). A fort was founded on the site of the present-day city in 1856. The settlement that developed around the fort was known as Steptoeville until it was incorporated as the town of Walla Walla in 1859; it was chartered as a city in 1862. Pop. (1970) 23,619.

WALLENSTEIN, Albrecht Eusebius Wenzel von, Duke of Friedland, Duke of Mecklenburg, Prince of Sagan (1583–1634), Austrian military leader born in Heřmaněč, Bohemia (now Czechoslovakia). Following the outbreak of the Thirty Years' War (q.v.) in Bohemia in 1618, he entered the service of Holy Roman Emperor Ferdinand II (q.v.). He distinguished himself in the emperor's conflict with the Transylvanian prince Gabriel Bethlen (q.v.), and in 1624 was created duke of Friedland. In 1626 he defeated the German commander, Count Peter Ernst Mansfeld II (1580–1626) at Dessau. He subsequently compelled both Mansfeld and Bethlen to abandon the war. In 1627 Wallenstein advanced as far as Jutland against the army of the Danish king Christian IV (q.v.), and in 1628 he took possession of the duchy of Mecklenburg. His plan of uniting Germany under the rule of the emperor was forestalled by his failure to capture the seaport of Stralsund in 1628.

With the invasion of Germany by the Swedish king Gustavus Adolphus (see GUSTAVUS II), Ferdinand's allies, the old princes of the empire, insisted upon the dismissal of Wallenstein. He resigned his command to Johan Tserclaes, Count of Tilly (q.v.), in 1630. In 1632 Tilly was mortally wounded at Lech, at which time Wallenstein

was recalled by the emperor. He expelled the Saxon forces from Bohemia and repulsed the attempt of Gustavus Adolphus to storm his entrenched camp near Nürnberg. In November, 1632, Wallenstein's army was defeated by the Swedish in the Battle of Lützen, but Gustavus himself was killed.

At this point Wallenstein formed plans for an alliance with the emperor's enemies. He wished to establish peace and religious tolerance and to reorganize the empire under his own authority. Distrusting his growing ambition and power, Ferdinand dismissed him publicly in January, 1634. Wallenstein was assassinated by imperial agents at Eger on February 25 of the same year.

WALLER, Edmund (1606–87), English poet, born in Coleshill near Amersham, Buckinghamshire, and educated at the University of Cambridge. He served several terms as a member of Parliament, and during the reign of the English king Charles I (q.v.) he was first a supporter and then an opponent of the Parliamentarians; see GREAT REBELLION. In 1643 he was involved in a Royalist conspiracy against Parliament known as Waller's Plot. He was arrested, fined, and banished from England, but was permitted to return in 1651. He continued to serve in Parliament until his retirement in 1677. Waller is important in the history of English poetry for his original use of the heroic couplet (see VERSIFICATION). The clarity and flowing pace of his style was highly praised by the English poets John Dryden and Alexander Pope (qq.v.). His famous poem "St. James' Park" was published in 1661 and his collected poetical works appeared in 1664.

WALLFLOWER, common name of plants of the genus *Cheiranthus* of the Mustard family, Cruciferae. The plants bear spikes of showy, fragrant flowers on branched stems 6 in. to 3 ft. in height. In cultivation wallflowers are usually grown as biennials, although in their natural range they grow as perennial evergreens. The common wallflower, *C. cheiri*, is found in rocky places and on old walls in the south of Europe, and also, but less abundantly, in the central part of Europe and in Britain. In its wild state these flowers are always yellow; in cultivation they exhibit a considerable diversity of colors, chiefly brown, purple, and variegated, and they attain a larger size. Another species with yellow flowers is *C. alpinus*; *C. mutabilis* bears purple-hued flowers. All are early spring flowers, often used in the garden as border plants, as well as on rock walls. The name "wallflower" is sometimes applied to the gillyflower (q.v.).

WALLINGFORD, town of Connecticut, in New Haven Co., 12 miles n.e. of the city of New

Haven. The town is part of the Meriden-Wallingford industrial center and is served by several railroads and airlines. The principal industries are the manufacture of automobile equipment, hardware, lighting equipment, paper boxes, plastics, and steel. Wallingford is the site of the Choate School, a private preparatory school for boys, founded in 1896. The Samuel Parsons House, built in 1770, containing an interesting collection of antiques, is owned by the Wallingford Historical Society. The site of the present town was settled about 1670 and was incorporated as a borough in 1853. The borough and town were consolidated in 1958. Pop. (1960) 29,920; (1970) 35,714.

WALLIS AND FUTUNA ISLANDS, overseas territory of France in the s.w. Pacific Ocean about 2500 miles n.e. of Sydney, Australia. The territory consists of two groups of volcanic islands approximately 125 mi. apart. Total area, 106 sq.mi.

The Wallis Archipelago comprises a main island and about twenty smaller islands and islets located at about lat. 13°22' S. and long. 176°12' W.; area, about 62 sq.mi. The main island is hilly and dotted with numerous lake-filled craters surrounded by steep cliffs.

The Futuna Archipelago consists of two mountainous islands, Futuna and Alofi, situated at about lat. 14°16' S. and long. 178°7' W.; area, 44 sq.mi. On Futuna the land rises steeply from a narrow coastal plain to an extreme elevation of 2870 ft. The coasts of Alofi are fringed by wide reefs. The highest summit is 1315 ft.

The climate is tropical, but moderated by ocean breezes. From October to April the weather is cool and dry with temperatures ranging between 68° F. and 77° F. A season of hurricanes with torrential rains and higher temperatures begins in April.

Except for cattle, sheep, and goats introduced by the administration, the only animals are snakes, lizards, and pigeons. Coconut palms and breadfruit, mango, and orange trees grow on the coastal lowlands, and the hills are covered by dense forests.

Government. The territory has an administrator appointed by the French government, a territorial council, and an assembly. The council is composed of the three chiefs of the islands and three members appointed by the administrator. The territorial assembly of twenty members is elected by the people who enjoy all the rights and privileges of French citizenship. The capital of the territory is Matautu on Wallis I. According to a United Nations estimate (1969) the population was 9000.

History. Futuna and Alofi were discovered in 1617 by two Dutch navigators. Wallis was discovered 100 years later by the British explorer Samuel Wallis (1728–95). French Catholic missions were established in the islands in 1837, and the native people were converted to Christianity. In 1887 at the request of the kings of the islands a French protectorate was established. The people voted overwhelmingly in December, 1959, for French citizenship and the status of an overseas territory, which was granted two years later.

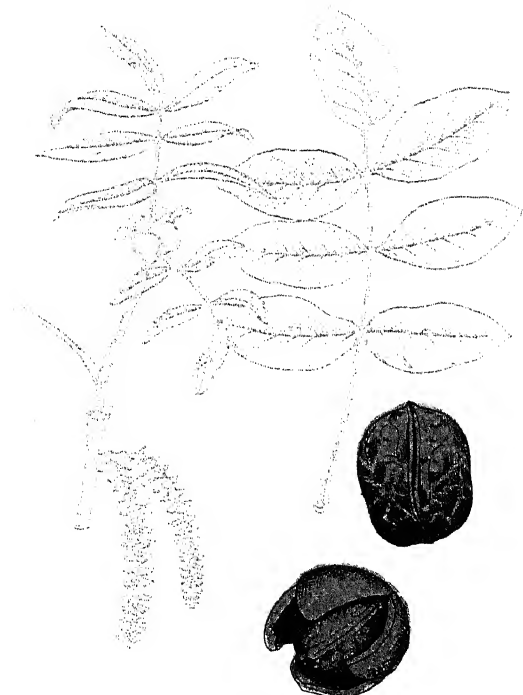
WALLOONS, French-speaking people of central and southern Belgium. They comprise one of the two principal ethnic groups found in Belgium, the other being the Flemings, a Dutch-speaking people of the northern provinces. The Walloons are chiefly descended from the Romanized Celts (see CELTIC PEOPLES AND LANGUAGES) of northern Gaul (q.v.), the so-called Belgae described by the Roman conqueror Gaius Julius Caesar (q.v.). Since the early Middle Ages (q.v.) the Walloons and the Flemings have been characterized by social and economic differences, and the division was intensified during the 19th century. The Walloon part of Belgium is a center of mining and heavy industry, while the northern Flemings are chiefly engaged in agriculture and the manufacture of textiles. During the religious wars of the 16th and 17th centuries, members of the few Protestant Walloon communities emigrated to the Netherlands and to America; see REFORMATION: *The Netherlands*. In the early 1970's the Walloon population of Belgium was about 3,725,000, and the Flemings numbered about 5,975,000. See also BELGIUM: *The People*.

WALLPAPER, decorative paper or material made to cover interior walls; see INTERIOR DECORATION. Modern wallpaper is produced by either surface, or standard, machine printing, using a separate roller for each color; rotogravure, employing photographically engraved, copper-covered steel rollers; or silk-screen process, an expensive hand or semi-automated method using a separate screen for each color. Superior wallpapers are block printed by hand. Flock paper, or velvet paper, is made by dusting ground wool, dyed various colors over patterns that have been printed with adhesive. Wallcoverings today are available in all types and grades of paper, fabric, and vinyl. Many of these are pre-pasted and washable, and most have edges pre-trimmed.

The history of wallpaper is interconnected with that of paper and of printing (qq.v.); see PRINTING TECHNIQUES. Although rice paper was ap-

WALNUT

parently hung on walls in China as early as 200 B.C., the practice reached Europe only in the 16th century as an alternative to more expensive tapestries. A guild of paperhangers was established in 1599 in France, where in about 1620 the first flock paper was invented. The invention of wallpaper as it is known today is attributed to the French engraver Jean Papillon who, in 1675, first made block designs in matching, continuous patterns. In subsequent centuries England played an important role in the development and improvement of manufacturing methods, and it was the British who introduced wallpaper to the United States in the 18th century. The exquisite designs of the British poet and artist William Morris (q.v.), in the late 1800's, represent the historical peak of wallpaper craftsmanship. **WALNUT**, deciduous, nut-bearing tree of the genus *Juglans*, in the family Juglandaceae. About fifteen species are native to North and South America and from southeastern Europe to eastern Asia. Walnuts are usually tall trees with large, pinnate leaves and small, greenish flowers. Several species yield valuable timber, which



English walnut, *Juglans regia*

is used principally in furniture making and for gunstocks. The nuts of all species are edible, and some are of great commercial importance. Walnut trees are grown also as ornamentals for their handsome foliage.

The most important species is the Persian or English walnut, *J. regia*, originally of southeastern Europe and China, and widely cultivated for its superior, thin-shelled nuts. The tree attains a maximum height of 100 ft.; its leaves have five to thirteen leaflets. In the United States it is grown chiefly in California, where the nuts are an important crop.

The best-known native American species is the black walnut, *J. nigra*, a stately tree reaching a height of 150 ft. and found in eastern U.S. It has long leaves with fifteen to twenty-three leaflets and bears nuts with thick, rough shells. Black walnut wood is beautifully grained and takes a good finish. Other American species include the white walnut, *J. cinerea*, known also as the butternut (q.v.).

WALNUT CANYON NATIONAL MONUMENT, region of historic interest in Arizona, near Flagstaff, containing the remains of about 300 Pueblo Indian cliff dwellings. The cliff dwellings, built in the walls of the Walnut Canyon, are believed to have been inhabited between 900 and 1100 A.D. Each separate dwelling contains 6 to 8 rooms, apparently accommodating single family units. The monument is administered by the National Park Service (q.v.).

WALPOLE, name of a family of British statesmen and writers. The more famous members were the following.

Sir Robert Walpole, 1st Earl of Orford (1676–1745), British statesman, born in Norfolk and educated at the University of Cambridge. He entered Parliament in 1701 and became known as a spokesman for Whig (q.v.) policy. In 1708 he was appointed secretary at war, and in 1710 he became treasurer of the navy, a position he lost when the Whig government was defeated in an election of the same year. In 1712 he was found guilty of corruption by a vindictive Tory (q.v.) Parliament and was briefly imprisoned.

On the accession of the first Hanoverian king of England, George I (q.v.), in 1714, Walpole, who had been a supporter of the German-born monarch, was restored to the cabinet, becoming first lord of the treasury and chancellor of the exchequer in October, 1715. Because of a conflict among the king's advisors, Walpole resigned in 1717, but he continued to exercise considerable influence as an opponent of government policy. He returned to the cabinet in 1720, a year of financial crisis caused by heavy speculation in the stock of the South Sea Company, a corporation founded in 1711 for the purpose of assuming the national debt; see **SOUTH SEA BUBBLE**. Members of the government were ac-

cused of manipulating the value of the stock, but Walpole was never proven to have abetted the scheme. He skillfully protected the court and the Whig leadership from political disaster.

From 1721 to 1742 Walpole served as leader of the House of Commons, first lord of the treasury, and chancellor of the exchequer, and he consolidated Whig power through a system of royal patronage. He secured large legislative majorities because his policies of continued peace and low taxation reflected the desires of Parliament, and he displayed an unsurpassed ability to unite the members on political issues.



Sir Robert Walpole

Because of his extensive political power and influence on the domestic and foreign policies of Great Britain during this period, Walpole is considered to have been the nation's first prime minister, although the title itself did not come into common use until much later in the century.

Opposition eventually developed within Walpole's own party, and a trade dispute with Spain was used by his critics to force him to declare war in 1739; see JENKINS' EAR, WAR OF. Although he won the election of 1741, a number of Whig politicians opposed his conduct of the war with Spain, and he resigned in February, 1742. Walpole was created earl of Orford in the same year, and he remained politically active until his death. See GREAT BRITAIN: *History: The Walpole Era*.

Horace Walpole, 4th Earl of Orford (1717–1797), British novelist and letter writer. Baptized

Horatio, he was the youngest son of Sir Robert Walpole, born in London, and educated at the University of Cambridge. In 1739 he traveled in Europe with his friend the British poet Thomas Gray (q.v.). He entered Parliament in 1741 and remained a member until his retirement in 1768. His political career was limited to minor government posts, which he received through his father's influence. In 1748 Walpole purchased the villa of Strawberry Hill, near Twickenham, a suburb of London. There he established a printing press in 1757, and the fine books he produced influenced the development of British printing. Walpole's writings include fiction, drama, history, art criticism, memoirs, and a voluminous correspondence. His novel *The Castle of Otranto* (1764) is one of the first works in the genre of the Gothic Romance (q.v.). His literary reputation now rests chiefly upon his letters, which have been highly praised as comprising a witty and comprehensive portrait of his time.

WALPOLE, Sir Hugh Seymour (1884–1941), British novelist, born in Auckland, New Zealand. He taught school for a short time, eventually turning to a career in writing. His earliest successful novel was *Fortitude* (1913). During World War I he served with the Red Cross (q.v.) in Russia, and in 1918 he was made a commander of the Order of the British Empire. He was knighted in 1937. Among Walpole's works are the adventure novels known as the Herries series (1930–33); the novels of social interest beginning with *The Duchess of Wrexhe* (1914); and the tale of suspense, *Portrait of a Man with Red Hair* (1925). Walpole's enormous literary production varies considerably in quality; his best novels are characterized by skillful narration and colorful description and sparked by a pervasive sense of humor.

WALPURGIS NIGHT. See WALBURGA, SAINT.

WALRUS, common name for large, marine mammals constituting the family Odobenidae of the suborder Pinnipedia, which also includes the seals; see SEAL. Two subspecies of the walrus exist, the Atlantic walrus, *Odobenus rosmarus rosmarus*, and the Pacific walrus, *O. rosmarus divergens*. Both are found in the Arctic Regions at the edge of the polar ice along the north-eastern coast of Siberia, the northwestern coast of Alaska, and north to Greenland and Ellesmere Island. Like eared seals, walruses can turn their hind limbs forward and thus use all four limbs in moving when ashore. Male walruses, which are larger than the females, average about 10 ft. in length and weigh more than 2000 lb. Both the male and female have a massive body with thick, wrinkled, nearly hairless skin. Both have a



*Pacific walrus, *Odobenus rosmarus divergens*, with calves, photographed in Alaska*

Carleton Ray-Photo Researchers

relatively small head with no external ears, a broad, bristled muzzle, and enormously elongated upper canine teeth forming heavy tusks. The tusks, up to 3 ft. long in some males, are used to rake the ocean bottom for mollusks and shellfish, which constitute the principal food of the walrus; they are also used as weapons in fighting, and as hooks in climbing on the ice. The Pacific walrus differs from the Atlantic subspecies in that its nostrils are more laterally located and are not visible when the animal is viewed from the front.

Walrus are highly social animals, congregating in herds, sometimes numbering more than 100 animals, on or near the shore or among the ice floes. The bellowing of a herd can be heard for great distances. They are gentle unless attacked; the whole herd will come to the defense of a member in danger. Polar bears (see BEAR) and man are the chief enemies of the walrus, which is hunted for its valuable ivory tusks and for its flesh and blubber. Excessive hunting has reduced the world population to an estimated 50,000 to 75,000 walrus.

WALSALL, Great Britain, county borough in Staffordshire, England, 8 miles N.W. of Birmingham. It stands on the edge of the Staffordshire coal field, and in the area are coal mines and

limestone quarries. In Walsall are plants producing leather products such as harnesses and saddles, automobile parts, corrugated iron, lamps, and wearing apparel. Pop. (1971) 184,606.

WALSINGHAM, Sir Francis (about 1530–90), English statesman, born in Chiselmurst (now part of Greater London) and educated at the University of Cambridge. He was a member of the first and second parliaments of the English queen Elizabeth I (q.v.) and a strong supporter of the English statesman William Cecil, 1st Baron Burghley (see under *CECIL*). In 1570 he was appointed ambassador to France, and in 1573 he became one of the queen's principal secretaries of state. Walsingham created an effective intelligence system by employing agents in foreign courts. The most notable plot he discovered was the plan to assassinate Queen Elizabeth, initiated by the English conspirator Anthony Babington and authorized by Mary, Queen of Scots (qq.v.). The evidence obtained by Walsingham led to the execution of Mary in 1587.

WALTER, Bruno, in full BRUNO WALTER SCHLESINGER (1876–1962), American conductor, born in Berlin. When he was four years old his feeling for pitch and rhythm were already deemed remarkable. He studied piano and conducting at the Stern Conservatory of Music, Berlin, and made his debut as a conductor in Cologne at the age of seventeen. After short periods as conductor in several European cities he

was appointed assistant to the Austrian composer and conductor Gustav Mahler (q.v.) at the *Hofoper* or Imperial Opera, Vienna. He served there from 1901 to 1913, a time referred to by critics as a "brilliant decade" for opera in Vienna. Posts in Munich, Berlin, and Leipzig followed.

In 1933 Walter left Germany for Austria; he became music director of the *Staatsoper* or Vienna State Opera two years later. After the annexation of Austria by Germany in 1938, Walter emigrated to France and was granted French citizenship. The following year he emigrated to the United States, where he had frequently toured following his New York City debut in 1922. During World War II he appeared with the NBC Symphony Orchestra, the New York Philharmonic, and the Metropolitan Opera, all in New York City. After World War II he appeared with most of the leading orchestras of Europe and the U.S. He became an American citizen in 1946.

Walter is best remembered as a conductor of the works of Austrian composers, especially Mahler, Wolfgang Amadeus Mozart, and Anton Bruckner (qq.v.). He is the author of the autobiographical *Theme and Variations* (1946) and *Of Music and Music Making* (1961).

Bruno Walter



WALTHAM, city of Massachusetts, in Middlesex Co., on the Charles R., 9 miles w. of Boston. Transportation facilities include several railroads. The city is the retail trading center of an area with a radius of 15 miles and a population of about 300,000, and is also an important manufacturing center, with diversified industries. Waltham is known for the manufacture of precision parts and products, notably the watches produced by the Waltham Watch Company, in operation from 1854 to 1950, the first successful mass production watch factory in the United States. Among products of more than 200 industrial establishments in the city are clothing, electrical machinery, electronics equipment, medical equipment, and precision instruments. Waltham is the site of Brandeis University, founded in 1948. Settled in 1634, Waltham was incorporated as a town in 1738 and as a city in 1884. It is said to be the site of the first mill in the U.S. in which all the operations of manufacturing cloth were performed under one roof. Pop. (1960) 55,413; (1970) 61,582.

WALTHER VON DER VOGELWEIDE. See GERMAN LITERATURE: *Middle High German Period*.

WALTON, Ernest Thomas Sinton (1903–), Irish physicist, born in Dungarvan, and educated at Trinity College, Dublin, and Trinity College, University of Cambridge. He held a succession of research awards at Cambridge from 1927 to 1934. He was named a fellow of Trinity College, Dublin, in 1934 and professor of natural and experimental philosophy in 1946.

Walton shared the 1951 Nobel Prize in physics with the British physicist Sir John Douglas Cockroft (q.v.) for joint research performed in 1932. The two physicists created one of the earliest particle accelerators, known as Cockroft-Walton accelerator, and achieved disintegration of nuclei of lithium atoms by bombardment with protons; see ACCELERATORS, PARTICLE; ATOM AND ATOMIC THEORY: *Nuclear Reactions*.

WALTON, Izaak (1593–1683), English man of letters, born in the parish of Saint Mary, Staffordshire. In 1624 he settled in London as a linen draper or ironmonger; he retired from business about twenty years later. Walton lived much of his later life at Winchester.

When he was sixty years old Walton wrote what became one of the most famous books in the English language. The first edition of *The Compleat Angler, or the Contemplative Man's Recreation* appeared in 1653. Walton's charming discourse on every aspect of fishing as a form of recreation is interspersed with dialogue, verses, songs, and idyllic glimpses of pastoral life. A fifth edition, expanded from thirteen chapters

WALTON, WILLIAM TURNER

to twenty-one, appeared in 1676. It included a supplement on fly fishing, written by Walton's friend the English poet Charles Cotton (1630–87), that henceforth formed the second part of the work.

Walton also wrote biographies, including those of his friends the poets John Donne (q.v.) and George Herbert (see under HERBERT), pub-



Izaak Walton

lished in 1640 and 1670, respectively. His verses frequently appeared in prefaces to works written by his friends.

WALTON, Sir William Turner (1902–), British composer, born in Oldham, and trained as a chorister at Christ Church Cathedral, Oxford University. In his youth he was associated with the British writers Osbert and Edith Sitwell (see under SITWELL); his first notable composition was a satiric suite, *Façade* (1923), composed to accompany recitations of poems by Edith Sitwell. In the same year he reached a wider, international audience with a string quartet, which was selected by a jury for performance at an international festival of contemporary music given in Salzburg, Austria. Walton's subsequent work forms a distinguished contribution to the body of modern music often called neoromantic. His style is generally marked by brilliant orchestration and musical wit; in more abstract works, however, his music exhibits a meditative strain, often with overtones of tragedy or pathos. Among his other works are the overture *Ports-*

mouth Point (1925), a *Violin Concerto* (1939), the opera *Troilus and Cressida* (1954), *Capriccio Burlesco* (1968), two symphonies, and music for motion pictures. Walton was knighted in 1951. **WALTZ**, graceful social dance performed by couples in triple time; also, the music to which this dance is performed. A typical waltz is composed in sixteen-measure sections. Each section contains a lilting melody in the treble accompanied by a simple repeated pattern in the bass; the bass pattern consists of a heavily accented downbeat followed by two faint afterbeats.

The waltz was developed from slower, heavier peasant dances such as the *ländler* in Germany and Austria in the late 18th century. In the 19th century the waltz achieved enormous popularity wherever social dances were performed. The famous Viennese waltz, particularly as developed in the mid-19th century by the Austrian composers Johann Strauss the elder and the younger (see under STRAUSS), known as the waltz kings, is conducted with one beat per measure, achieving an effect of lightness and agility. Many composers of art music have produced concert waltzes or introduced them into their serious compositions; among these are the Austrian Franz Peter Schubert; the Germans Karl Maria von Weber, Johannes Brahms, and Richard Strauss; the French Louis Hector Berlioz and Maurice Joseph Ravel; the Russian Pëtr Ilich Tchaikovsky; and the Polish Frédéric François Chopin (qq.v.). Although the popularity of the waltz as a ballroom dance has declined, waltzes are still composed in the 1970's, some by serious composers of art music, others falling into the category of popular music (q.v.).

See DANCE: *Popular Dance in Western Civilization: Ballroom and Social Dance.*

WAMPANOAG, North American Indian tribe of the Algonquian (q.v.) linguistic stock, formerly occupying the territory between the eastern shore of Narragansett Bay and the Atlantic coast, including the islands of Nantucket and Martha's Vineyard. In 1620 the Wampanoag were said to be settled in about thirty villages. Massasoit (q.v.), a Wampanoag chief, signed the first peace treaty with the English colonists. Some decades later, however, the tribe was virtually exterminated during an uprising, led by Massasoit's son Philip (q.v.) and known as King Philip's War.

WAMPUM, polished shell beads, formerly employed as a medium of exchange by North American Indian tribes, and also worn as decoration and insignia of rank and dignity. The beads were strung on hempen strings or woven into belts. In trade, unstrung beads were ex-



An Iroquois war wampum belt.

Museum of the American Indian

changed by a count and belts and strings were traded by the fathom, or number of beads that could be sold for a price of five British shillings. Wampum belts were also used as a means of documenting intertribal transactions and important public events. A communication from one tribe or council to another became official with the delivery of a belt woven into a symbolic representation of the message or treaty thus verified.

WANAMAKER, John (1838–1922), American merchant, born in Philadelphia, Pa. In 1857 he left a job as a salesman in a men's clothing store and became secretary of the Philadelphia Young Men's Christian Association. In 1861 he returned to business as a partner in the clothing firm of Wanamaker and Brown. Eight years later he opened the men's store known as John Wanamaker and Company, which later expanded to include a group of specialty shops comprising one of the largest department stores (q.v.) in the country. In 1896 Wanamaker purchased the New York City store founded by the American merchant Alexander Turney Stewart (1803–76). Wanamaker was one of the first merchants to undertake large-scale advertising campaigns and

to utilize the service of advertising agencies. From 1870 to 1883 he was president of the Philadelphia Y.M.C.A., and from 1889 to 1893 he served as postmaster general in the cabinet (q.v.) of President Benjamin Harrison (q.v.).

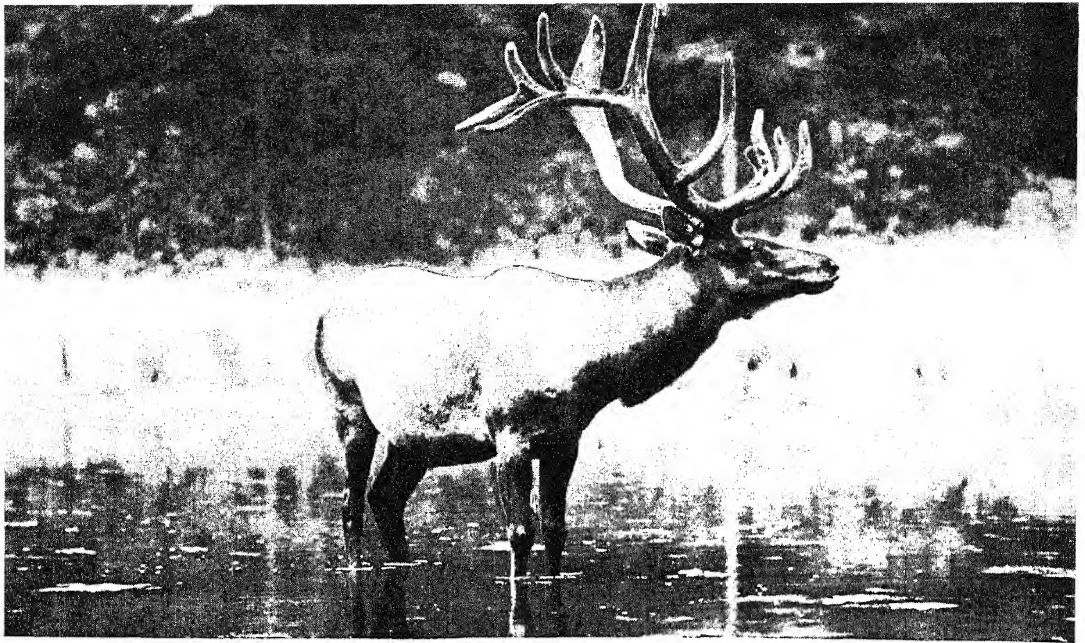
WANDERING JEW, THE, central figure of a legend about a Jew who refused to allow Jesus Christ (q.v.) to rest at his door as He bore His cross toward Calvary (q.v.). As a result, the Jew was condemned by Jesus to wander over the face of the earth until His second coming; see **SECOND ADVENT OF CHRIST**. A legend resembling this tale but not identifying the wanderer as a Jew was recorded in medieval times. The wanderer became a Jew in a German work of the 17th century, and thereafter the legend attained great popularity, frequently serving as a vehicle for anti-Semitism (q.v.). Among its numerous treatments in literature is that of the French novelist Eugène Sue (q.v.) in *The Wandering Jew* (1844–45).

WANG WEI. See **CHINESE LITERATURE: Medieval Period**.

WANTAGH, unincorporated community of New York, in Nassau Co., on Long Island, in Hempstead town, 26 miles E. of Manhattan. Local manufactures include stone vaults, hardware, housing equipment, and machine products. On the S. shore of the island, a causeway between East Bay and South Oyster Bay leads S. to Jones Beach State Park, with bathing facilities. Pop. (1960) 34,172; (1970) 21,873.

WAPITI, or **AMERICAN ELK**, ruminant mammal, *Cervus canadensis*, belonging to the Deer family (Cervidae), native to the northern part of the Western Hemisphere. It has dark-brown fur on the head and neck, and creamy-gray fur on the back and flanks. A full-grown stag stands about 5½ ft. high at the shoulder, and weighs about 700 lb. The antlers are smooth and attain a great size, averaging over 4 ft. each in length. The antlers are shed in March, begin to grow again in late spring, and are fully grown by fall. Wapiti graze and browse on grasses, twigs, leaves, and other green vegetation.

The wapiti formerly ranged throughout the temperate regions of the Western Hemisphere, but the advance of civilization, limiting its range and causing huge herds to be slaughtered for food and sport, effected a great reduction in numbers; the animal is now largely restricted to the mountainous areas of the western United States and Canada. The stags live apart from the main herd during most of the year, joining the herd only during the mating season. At this time the stags fight furiously over the right to the females, accompanying these fights with a



Wapiti, *Cervus canadensis*

New York Zoological Society

braying call which has earned the animals the name of jackass deer in certain sections of the Rocky Mts. In late spring wapitis leave the lowlands and migrate to the upper reaches of the mountain forests. The doe bears a single fawn soon after reaching the forest.

See also ELK.

WAR, in international law, armed conflict between two or more governments or states. When such conflicts assume global proportions, they are known as world wars; see **WORLD WAR I**; **WORLD WAR II**. War between different parts or fractions of the same nation is termed civil war. A rebellion (q.v.) is not legally considered a war; to entitle the armed forces of the rebels to the rights and privileges of belligerents (see **BELLIGERENT**), the government which they serve must be organized so as to be in a position to meet the duties resting on belligerents, that is, they must have the power to maintain law and order within the regions occupied by them and to carry on war on a large scale by land, sea, or air. International hostilities sometimes rage for extended periods of time without being acknowledged as wars. The Korean War (q.v.) was regarded by the United States government as a police action. Conflicts or wars in which major powers purposely refrain from employing all their armed strength are often known as limited wars. Short of peace, such limited wars are now recognized as a preferable alternative to the spectre of nuclear war. See **WARFARE**.

International wars are generally terminated by treaty (q.v.), and civil wars by a peace proclama-

tion. The usages, customs, and treaties of nations have formed a system of laws of war. See **PRISONERS OF WAR**; **RED CROSS**, **INTERNATIONAL**.

For a discussion of principles governing the declaration of wars, see **WAR**, **DECLARATION OF**. See also **BLOCKADE**; **COLD WAR**; **HAGUE CONFERENCES**; **INTERNATIONAL LAW**; **NEUTRALITY**; **SEARCH**, **RIGHT OF**.

WARANGAL, city of the Republic of India, in Andhra Pradesh State, 85 miles N.E. of Hyderabad. On a railroad and in an area raising rice, peanuts, grains, and livestock, the city includes among its industries cotton, rice, and grain milling, tanning, wool processing, printing, and carpet weaving. The rail junction of Kazipet lies 5 miles to the S.W. In Warangal are the Arts and Sciences College of Osmania University and the affiliated Government Teachers' Training College. A 12th-century Hindu temple is in the city, and Warangal Fort, 5 miles to the S.E., is the site of the 13th-century capital of a Hindu kingdom. Formerly a part of Hyderabad princely state, the city is sometimes called Hanamkonda. Pop. (1971) 207,130.

WARBECK, Perkin (1474–99), pretender to the English throne, born in Tournai, Flanders. He appeared in 1491 in Cork, Ireland, in the service of a Breton silk merchant. Although Warbeck denied it, he was believed, reportedly because of his lavish silk clothes, to be a son of George, Duke of Clarence (see under **CLARENCE**) or of Richard III (q.v.), King of England. When noble adherents of the Yorkist party offered to support him, however, he professed to being Richard, Duke of York, a younger son of Edward IV (q.v.), King of England. Subsequently, he was taught to

speak good English and to behave royally, and was recognized as the legitimate king of England by a number of European rulers. Chief among these were Edward IV's sister, Margaret, Duchess of Burgundy (1446–1503), the staunchest supporter of the Yorkist exiles; Charles VIII, King of France (see *under* CHARLES); and Maximilian I (q.v.), Holy Roman Emperor.

In 1495, financed by Maximilian, Warbeck twice tried and failed to land expeditionary forces in the British Isles. Two years later, aided by James IV (q.v.), King of Scotland, Warbeck finally effected a landing, proclaimed himself Richard IV, and raised an army, only to flee when his forces met those of Henry VII (q.v.), the first Tudor king of England. Taken captive, Warbeck confessed his imposture, was paraded derisively through the streets, and imprisoned in the Tower of London (q.v.). He was later hanged for attempting to escape. See also *ROSES*, *WAR of the*.

WAR BETWEEN THE STATES. See *CIVIL WAR*, *THE AMERICAN*.

WARBLER, common name for birds of the chiefly Old World family Sylviidae. The grasshopper warbler, *Locustella naevia*, is found in most parts of central and southern Europe, mainly during the summer. It is of a generally greenish-brown color, but the centers of the feathers are dark brown and the lower parts are pale brown, producing a spotted appearance. The sedge warbler, *Acrocephalus schoenobaenus*, is found in thick patches of reeds or

willows in marshes, or in other locations near water. The reed warbler, *A. scirpaceus*, abounds in the Netherlands and in many other parts of Europe, and its range extends to northern India. The chiffchaff, *Phylloscopus collybita*, named for its two-noted cry, is a familiar early migrant to Great Britain. The willow warbler, *P. trochilus*, frequents woods, hedgerows, and bushes, but builds its nest on the ground. Kinglets and gnatcatchers, both of which are found in the United States, are now placed in the Sylviidae family. Numerous species of wood warblers found in North America belong to a separate family; see *WOOD WARBLER*.

WARBURG, Otto Heinrich (1883–1970), German biochemist and physiologist, born in Freiburg, and educated at the universities of Berlin and Heidelberg. He became a member of the Kaiser Wilhelm Association in 1913 and director of the Max Planck Institute for Cell Physiology in Berlin in 1931.

Trained in physiology as well as chemistry, Warburg conducted outstanding research on the oxidation process in living cells, particularly in cancer cells. He investigated the nature and action of those enzymes (q.v.) involved in respiration and fermentation (qq.v.). In 1923 Warburg successfully devised a method for measuring the amount of oxygen absorbed by a living, respiring tissue, and this proved to be of great importance in later research into the processes of metabolism (q.v.) in cancerous tissue; see *CANCER*. He was awarded the 1931 Nobel Prize in medicine and physiology for his work on the respiratory enzyme. His writings include *Über den Stoffwechsel in der Tumoren* ("The Metabolism of Tumors", 1926), and *Chemie der Photosynthese* ("Chemistry of Photosynthesis", 1951).

WAR-CRIMES TRIALS, general designation of trials of persons charged with criminal violation of the laws and customs of war and related principles of international law. After World War II the phrase referred usually to the trials of German and Japanese leaders in courts established by the victorious Allied nations.

The most important of these trials were held in Nuremberg, Germany, under the authority of two legal instruments. One, the so-called London Agreement, was signed by representatives of the United States, Great Britain, France, and the Soviet Union in London, England, on Aug. 8, 1945; the other, Law No. 10, was promulgated by the Allied Control Council in Berlin on Dec. 20, 1945.

The London Agreement provided for the establishment of the International Military Tribunal, composed of one judge and one alternate

Sedge warbler, *Acrocephalus schoenobaenus*

Lars-Arne Feldtblad - National Audubon Society



WAR-CRIMES TRIALS

judge from each of the signatory nations, to try war criminals. Under the London Agreement, the crimes charged against defendants fell into three general categories: crimes against peace, that is, crimes involving the planning, initiating, and waging of aggressive war; war crimes, that is, violations of the laws and customs of war as embodied in the Hague Conventions (see HAGUE CONFERENCES) and generally recognized by the military forces of civilized nations; and crimes against humanity, such as the extermination of racial, ethnic, and religious groups and other large-scale atrocities against civilians.

Nuremberg Trials. On Oct. 18, 1945, the chief prosecutors lodged an indictment with the tribunal charging twenty-four individuals with a variety of crimes and atrocities, including the deliberate instigation of aggressive wars, extermination of racial and religious groups, murder and mistreatment of prisoners of war, and the murder, mistreatment, and deportation to slave labor of hundreds of thousands of inhabitants of countries occupied by Germany during the war.

Among the accused were the National Socialist leaders Hermann Göring and Rudolf Hess, the diplomat Joachim von Ribbentrop (q.v.), the munitions maker Gustav Krupp von Bohlen und Halbach (see under KRUPP), Field Marshal Wilhelm Keitel (q.v.), Grand Admiral Erich Raeder (1876–1960), and eighteen other military leaders and civilian officials; see GERMANY: History; NATIONAL SOCIALISM. Seven organizations that formed part of the basic structure of the Nazi government were also charged as crimi-

nal. These organizations included the SS (*Schutzstaffel*, "Defense Corps"), the Gestapo (*Geheime Staatspolizei*, "Secret State Police"), the SA (*Sturmabteilung*, "Storm Troops"), and the General Staff and High Command of the German armed forces.

The trial began on Nov. 20, 1945. Much of the evidence submitted by the prosecution consisted of original military, diplomatic, and other government documents that fell into the hands of the Allied forces after the collapse of the German government.

The judgment of the International Military Tribunal was handed down on Sept. 30–Oct. 1, 1946. Among notable features of the decision was the conclusion, in accordance with the London Agreement, that to plan or instigate an aggressive war is a crime under the principles of international law. The tribunal rejected the contention of the defense that such acts had not been defined theretofore as crimes under international law and that therefore the condemnation of the defendants would violate the principle of justice prohibiting *ex post facto* punishments. It also rejected the contention of a number of the defendants that they were not legally responsible for their acts because they performed the acts under the orders of superior authority, stating that "The true test . . . is not the existence of the order, but whether moral choice [in executing it] was in fact possible".

With respect to war crimes and crimes against humanity, the tribunal found overwhelming evidence of a systematic rule of violence, brutality, and terrorism by the German government in the territories occupied by its forces. Millions of persons were destroyed in concentration camps, many of which were equipped with gas chambers for the extermination of Jews, Gypsies, and members of other ethnic or religious groups; see GENOCIDE. Under the slave-

Japanese military leaders of World War II on trial in Tokyo before the International Military Tribunal for the Far East in July, 1948. At center (with glasses and mustache) is the foremost of the twenty-eight defendants, former premier Hideki Tojo, who was convicted of war crimes and executed on Dec. 23, 1948.

UPI



labor policy of the German government, at least 5,000,000 persons had been forcibly deported from their homes to Germany. Many of them died because of inhuman treatment. The tribunal also found that atrocities had been committed on a large scale and as a matter of official policy. See also CONCENTRATION CAMP.

Of the seven indicted organizations, the tribunal declared criminal the Leadership Corps of the National Socialist Party, the SS, the SD (*Sicherheitsdienst*, "Security Service"), and the Gestapo.

Twelve defendants were sentenced to death by hanging, seven received prison terms ranging from ten years to life, and three, including the German politician and diplomat Franz von Papen and the president of the German Central Bank Hjalmar Horace Greeley Schacht (q.v.), were acquitted. The defendants who had been condemned to death were hanged in the Nuremberg jail on Oct. 16, 1946. Göring committed suicide in prison a few hours before he was to be executed.

After the conclusion of the first Nuremberg trial, twelve more trials were held under the authority of Control Council Law No. 10, which closely resembled the London Agreement but provided for war-crimes trials in each of the four zones of occupied Germany.

About 185 individuals were indicted in the twelve cases. Those indicted included doctors who had conducted medical experiments on concentration-camp inmates and prisoners of war, judges who had committed murder and other crimes under the guise of the judicial process, and industrialists who had participated in the looting of occupied countries and in the forced-labor program. Other persons indicted included SS officials who had headed the concentration camps, administered the Nazi racial laws, and carried out the extermination of Jews and other groups in the eastern territories overrun by the German army; and high military and civilian officials who bore responsibility for these and other criminal acts and policies of the Third Reich. A number of doctors and SS leaders were condemned to death by hanging, and approximately 120 other defendants were given prison sentences of various durations. Thirty-five defendants were acquitted.

Tokyo and Other Trials. Another war-crimes trial was held under international authority in Tokyo. The International Military Tribunal for the Far East was constituted under the authority of a charter promulgated on Jan. 19, 1946, by American General of the Army Douglas MacArthur (q.v.), Supreme Commander for the Allied

Powers. Many of the provisions of the charter were adapted from those of the London Agreement.

The Tokyo trial opened on May 3, 1946, and held its final session on Nov. 12, 1948. The conclusions reached by the eleven-nation tribunal were generally parallel to those embodied in the judgment given in Nuremberg. Of the twenty-eight defendants named in the indictment, seven were condemned to death by hanging, and all but two of the others were sentenced to life imprisonment.

Many other trials of alleged war criminals were held by tribunals constituted by the governments of the countries that had been occupied in whole or in part by Germany or Japan during World War II. In addition, military tribunals in the British and American zones of occupation in Germany tried Germans under the laws of war. Numerous trials of Japanese military officers were held also in the Philippines and Australia and by American military courts on Japanese territory. For the most part, these trials were based on alleged violations of the laws and customs of war and did not involve the crimes against peace and crimes against humanity that had constituted an important part of the Nuremberg proceedings.

Alleged war criminals were being brought to trial long after the end of World War II. In 1960 the Austrian Karl Adolf Eichmann (1906–62), who had been a member of the German SS and an organizer of anti-Semitic activities, was captured as a war criminal in Argentina by Israeli agents. Taken to Jerusalem, he was tried and condemned the following year and executed in 1962.

Effects. The Nuremberg and other war-crimes trials were a notable step in the evolution of international penal law. The standing of the trials suffered sharply, however, from the fact that the proceedings were carried out under the auspices of victorious powers and that the charges were brought only against the nationals of vanquished Germany and Japan. Nevertheless, the principles applied in the Nuremberg and Tokyo trials helped to strengthen international law and the judicial mechanisms for its enforcement. Also, the United Nations (q.v.) has ratified the general principles of the trials. T.T.

WARD. See GUARDIAN.

WARD, Artemus. See BROWNE, CHARLES FARRAR.

WAR, DECLARATION OF, formal announcement of hostile intentions by one country to another. Such declarations are of two types.

Declarations Preceding Hostilities. The practice of making a declaration before actually

WAR, DECLARATION OF

committing an act of war originated in the feudal custom of sending heralds to warn an enemy of impending hostilities. Such declarations of war were usual from feudal times until the early 18th century. Modern international law does not require a formal declaration of war preceding hostilities; nevertheless, occasionally a war is still declared in this manner. One of the best-known examples of a declaration preceding hostilities was the French declaration of war against Prussia in 1870. The declaration was made on July 19; the first overt act of the Franco-German War (q.v.), an attack by French troops on Prussian forces in the town of Saarbrücken, took place on August 2. The Second Hague Conference (see HAGUE CONFERENCES), which met in 1907, accepted a convention asserting that hostilities between nations might not be undertaken without a prior declaration; this convention was largely ignored after World War I. According to the Charter of the United Nations (q.v.), all nations are to refrain from the use of force in the settlement of disputes. Nations engaged in conflict have therefore attempted to avoid the charge that they are at war by avoiding formal declarations. Jurists have assumed, however, that serious hostilities constitute war materially if not legally and that such wars begin with the first act of conflict.

Declarations After Hostilities Have Commenced. Such declarations have sometimes been made by belligerents in modern times as a means of justifying their actions in international law and world opinion. Usually, diplomatic exchanges over controversial issues or commercial discriminations precede such declarations, and after hostilities have begun both parties frequently assert that they are acting in self-defense. In some cases a nation presents an ultimatum, or conditional declaration of war, stating that unless a favorable reply to its terms is received within a certain time, that nation will commence war with the other. On Jan. 13, 1904, the government of Japan issued such an ultimatum to the Russian government, which did not meet the Japanese terms; actual hostilities in the ensuing Russo-Japanese War (q.v.) began on February 8, and both governments issued formal declarations of war on February 10. Sometimes a sudden attack by one nation upon another takes place without ultimatum or declaration of war. An example of this procedure was the attack by Japan on the United States naval base at Pearl Harbor (q.v.), Hawaii, on Dec. 7, 1941. The declaration of war against Japan by which the U.S. entered World War II (q.v.) was made by Congress on Dec. 8, 1941.

In most nations the power to declare war belongs to the executive or sovereign. The Constitution of the United States (q.v.), in Article I, Section 8, vests this power in Congress, but the Supreme Court of the United States has held that the President may recognize a "state of war" initiated against the U.S. by a foreign power or by domestic insurgents.

See WAR.

Q.W.

WAR, DEPARTMENT OF, former executive department of the United States government, created by Congress on Aug. 7, 1789, and incorporated in the National Military Establishment in 1947 under the title of Department of the Army. It had at its head a secretary appointed by the President, who ranked third among the cabinet members in the line of succession to the Presidency of the United States. During its existence the War Department had charge of all aspects of military affairs, including distribution of stores, surveying and improvement of harbors, the signal service, and administration of insular possessions. See ARMY, DEPARTMENT OF; DEFENSE, DEPARTMENT OF.

WARFARE, use of force on the part of one organized group against another. Warfare seeks to bring about or resist political, social, or economic changes. Warfare occurs in a variety of forms, among them military confrontation, insurrections, revolts, revolutions, coups d'état, ambushes, raids, or terrorism. The object of military operations in warfare is to convince the enemy that he cannot win in combat and that it is therefore to his advantage to accept the conditions of the victor rather than continue a hopeless struggle.

In total or general warfare, each belligerent (q.v.) marshals all available force to defeat the enemy entirely, to force the loser to accept the terms of the winner. Limited war is a conflict restricted in terms of the objectives desired and the means employed to obtain them. Military policy is concerned with the development and use of the types of armed forces the nation requires, including the methods of procuring, equipping, and training them. The overall plan devised to defeat the enemy is called strategy (q.v.). The actual techniques carried out against the enemy are tactics (q.v.), which consist of the procedures for winning on the battlefield, in naval battle, and in aerial combat.

The military institutions of a nation and the way it wages war are determined principally by its form of government, social structure, economic strength, and geographical position. Israel, for example, surrounded by hostile neighbors and lacking both great wealth and a large

population, depends on a highly trained body of reserves that can be mobilized quickly. Great Britain, in the 19th century an island nation with limited manpower and dependent on sea trade, maintained a superior navy and sought a balance of power among the nations of Europe to prevent war. The Russians, occupying an enormous and inhospitable land mass, maintained a large army and developed during the 19th century a policy of strategic retreat to wear down an invading force. Before World War II the United States, taking advantage of its isolated geographical location, maintained only a small standing army and depended on its navy and that of Great Britain to keep the peace.

Historical Background. The most ancient civilizations, such as prevailed in Assyria, Babylonia, Egypt, Israel, and Persia, maintained armies. The earliest weapons can be divided into those that were hurled from a distance, such as slings, bows, and javelins, and those used in close combat, such as the club, spear, pike, lance, and sword. The Egyptian and Assyrian armies had charioteers as well as archers and slingers. The Persians relied on cavalry armed with the bow and the javelin. The Greeks depended on foot soldiers, or hoplites, armed with pikes and formed into massed groups called phalanxes.

Early warfare at sea was characterized by the use of galleys (see *GALLEY*), lightly built ships propelled by rowers and carrying a sail that was hoisted when the wind was favorable. Galleys were used by pirate raiders as early as 1400 B.C., and they dominated naval warfare from the Battle of Salamis (q.v.), fought in 480 B.C., to the Battle of Lepanto (q.v.), fought in 1571 A.D. Galleys operated within a short distance from their base, attempted to sink enemy ships by ramming them, and carried infantrymen for boarding enemy ships or making raids ashore. The trireme, a galley with three banks of rowers, was developed by the Greeks and used in their wars with the Persians. By 300 B.C., galleys carrying catapults and movable wooden fighting turrets had been built.

Greek and Roman Military Techniques. Philip II (q.v.), King of Macedonia, developed the military system that his son, Alexander III (q.v.), called the Great, used to conquer the known civilized world. The basic weapon was the pike, and the basic tactical unit was the phalanx. Cavalry protected the flanks and charged the enemy after the initial shock delivered by the phalanx. Other troops armed with bows, javelins, and slings also guarded the flanks of the phalanx and harassed the enemy from a distance.

The Romans depended on infantry armed

with a short sword and organized into legions. The legion, often regarded as the prototype of the modern combat team, was the basic tactical organization that also comprised cavalry units and missilemen. The Romans developed the art of warfare to a high degree, evolving a system of tactics and maintaining a professional, highly disciplined army with a strong esprit de corps. The army lived in fortified camps and garrisons on the borders of the Roman Empire. An excellent system of roads enabled the army to move swiftly to any trouble spot.

The Mounted Soldier. The decline of the Roman Empire in the West and the invasions of barbarian tribes brought into prominence a new type of warfare. From the 3rd century A.D. to the 13th century, armed cavalry, using the spear or lance as their primary weapon, dominated warfare. The raids and conquests of the Goths, Magyars, and Arabs during this period, as well as the general breakdown in law and order, forced the development of castles and fortified towns, and stimulated the development of the feudal system in which the weak sought the protection of strong lords; see *CASTLE*; *FEUDALISM*. The art of laying siege became highly developed, as did the art of repulsing a siege; see *FORTIFICATION* AND *SIEGECRAFT*. Warfare became the business of armored knights (see *KNIGHT*) on horseback who fought with lances and swords on behalf of a lord. In time, knights developed into a professional class of fighters. But as their armor (q.v.) became heavier and more cumbersome, maneuver declined in importance and tactics degenerated into a primitive, blind frontal attack.

Archery. By the 8th century, the long sword (q.v.), used by dismounted as well as by mounted soldiers, became an effective weapon against cavalry, but it was the reappearance of the bow in Europe that again changed the nature of warfare (see *ARCHERY*). Fortified towns adopted the crossbow (q.v.) as their principal weapon, and it was widely used in Italy. The crossbow, already used in China about 200 B.C., proved so lethal a weapon that the Catholic Church banned its use against Christians; it was widely used against Muslims in the Crusades.

The English longbow, used so effectively in the 14th-century battles of Crécy and Agincourt (qq.v.), hastened the downfall of the armored knight. With the invention of the arquebus, the first practical musket, in the 15th century (see *SMALL ARMS*), mounted knights became obsolete altogether.

Guns, A Turning Point. The 14th century also saw the rebirth of the infantry as an effective

fighting force. The Swiss, too poor to afford horses and armor, created disciplined masses of pikemen capable of driving armored knights from the field. Armed with arquebuses and muskets, infantrymen again became the decisive force in warfare.

The use of gunpowder (q.v.) led to the installation of one or more cannon (q.v.) in the bow of ships and the use of marines armed with hand weapons. These changes coincided with the advent of sailing ships.

The defeat of the Spanish Armada (see ARMADA) in 1588 marked a turning point in naval warfare. Instead of attempting to come close to an enemy ship in order to ram or board it, naval battles were fought by sailing ships that fired cannon at each other from a distance of several hundred yards. These ships, heavily supplied with arms, food, and water, could remain at sea for prolonged periods, independent of their bases. Their principal weapon was the muzzle-loaded, smoothbore long gun mounted on a wooden carriage. Naval tactics consisted of maneuvering a ship so that its broadside of a full battery of guns could be brought to bear against the enemy in a position or at a time least advantageous to the enemy.

Origin of the Modern Army. With the emergence of the modern nation-state in the 16th century, small but professional armies evolved. Mercenary soldiers hired out their services individually or as members of bands known variously as free companies, *condottieri* (q.v.), and *landsknecht*. Mercenaries (q.v.) brought experience and discipline to warfare. At the same time they looked forward to fighting again another day, and Renaissance battles became formal set pieces, with maneuver and tactical advantage the objectives rather than pitched battle.

Larger forces maintained by the rising nation-states were commanded by members of the aristocracy, and the ranks were largely filled by the unemployed, vagabonds, criminals, marginal farmers, and the dispossessed. Equipping, training, and maintaining troops was expensive, and armed conflicts fought to secure dynastic successions, adjust boundaries, or secure a political advantage tended to be limited in scope and intensity to keep expenses to a minimum. Wars of religion, on the other hand, such as the Thirty Years' War (q.v.) in which popular passions were aroused, were fought with bloody, exterminating zeal.

The Thirty Years' War marked the beginning of modern armies. Military units became fixed in composition and size, uniforms were issued, command arrangements were formalized, and

armies were more efficiently organized and supplied. In Sweden, Gustavus II (q.v.), did most to further the modern organization of warfare. He instituted universal military service, integrated his inexperienced troops with professional mercenaries, trained his soldiers assiduously, lightened their weapons to improve mobility, and perfected linear tactics (in which soldiers form long lines that advance and fire in unison). He used his infantry, cavalry, and artillery proficiently and as a unified battle force. In the 18th century, the French made use of staff officers to handle the increasingly specialized tasks of supply, transportation, and engineering.

The French Revolution introduced conscription (q.v.) into warfare. Surrounded by hostile states, France had no time to develop a professional army. Patriotism now began to replace professionalism, and national armies increased enormously in size. In place of thoroughly trained troops firing in unison and formed in lines, the French marched and fought in loose columns, the men firing individually as they advanced, supported by concentrated artillery fire. Napoleon I (q.v.) made full use of newly developed maneuverability to surprise and outflank his opponents.

The Influence of Technology. The industrial revolution (q.v.) ushered in a period of technological change that transformed the conduct of warfare, although the basic strategic and tactical principles remained unchanged. The power and accuracy of infantry weapons and of the artillery (q.v.) increased greatly with the introduction of rifled bores, high-velocity bullets, and high explosives (see EXPLOSIVES). The steam engine made possible the railroad and steamboat, which increased the speed with which troops and supplies could be transported and deployed. The telegraph revolutionized communications. In the 20th century the internal-combustion engine led to the development of tanks, aircraft, and motorized infantry artillery.

Armies in the 19th century modeled themselves on the Prussian army, which had developed an efficient staff system of specialist officers who took full advantage of the new technology and the increased maneuverability made possible by the railroad. The Prussian army quickly defeated Austria in 1866 and, in alliance with other German States, followed this with the defeat of France in 1870–71; see FRANCO-GERMAN WAR; SEVEN WEEKS' WAR. The most significant portent of future warfare, however, was the American Civil War, in which the North used its industrial capacity to overwhelm the South and leave it economically exhausted.

Modern Sea Warfare. The 19th century witnessed the decline of wooden sailing ships and the rise of iron ships powered by steam engines. Steamships were propelled at first by paddlewheels, then by screw propellers. Rotating armored turrets firing explosive-filled shells replaced the carriage-mounted gun firing cannonballs. By the beginning of the 20th century, heavily armored battleships were the principal fighting vessels of the British navy.

The Germans also built a High Seas Fleet of surface ships, but in World War I they did not challenge the British Grand Fleet, except at the Battle of Jutland; see JUTLAND, BATTLE OF. Instead, Germany stressed the use of large numbers of submarines to attack surface ships with torpedoes, and their operations disrupted the Allied shipping on which the armies fighting in overseas theaters depended for sustenance. The submarines were in turn hunted by destroyers armed with depth charges; see SUBMARINE; TORPEDO. See also SHIPS, NAVAL.

Total War. At the beginning of the 20th century it was the general anticipation among military men that the next great war, when it came, would be a rapid offensive war on the model of the wars of the 19th century. Instead the invention of the machine gun (q.v.) and barbed wire gave the advantage to the defense. The result was World War I (q.v.), an exhausting four-year stalemate in which 10,000,000 men were killed and the participants depleted of their accumulated wealth. This total war witnessed the advent of the airplane (q.v.) and airship in military action; see AIR WARFARE. Mines were widely used on land and sea; see MINE. Trench warfare, introduced during the American Civil War, was used extensively, and advances in science permitted chemical warfare and gas warfare (qq.v.), as well as experiments in the use of disease-producing agents against the enemy (see BIOLOGICAL WARFARE).

After World War I most military analysts expected future conflicts to be wars of attrition and defense. The French, therefore, built the Maginot Line (q.v.). But the Germans, abandoning preconceived notions, developed the *blitzkrieg*, a rapid advance into enemy territory by tanks and motorized infantry supported by aircraft. In World War II (q.v.) the British and American armies and their allies adopted these tactics and, having greater material resources than the Axis powers (q.v.), defeated them after a worldwide conflict lasting six years. World War II, also a total war, saw the development of electronics and radar (qq.v.), long-range bombardment by aircraft (see AIRCRAFT CARRIER), and

massive submarine and antisubmarine warfare. Amphibious assault techniques were perfected with the creation of a family of landing ships and craft able to deposit large masses of troops and equipment on enemy beaches. Methods of command were refined, airborne troops were dropped by parachute and glider behind enemy lines, often to contact and supply guerrillas (q.v.); and propaganda (q.v.) was widely disseminated by newspapers, radio broadcasts, and enemy infiltrators. Toward the end of the war, jet aircraft, guided missiles (q.v.), and the atomic bomb were developed. Atomic bombs were used on the Japanese cities of Hiroshima and Nagasaki (qq.v.). See NUCLEAR WEAPONS.

Nuclear Weapons and Psychological Warfare. The postwar period saw the development of the intercontinental ballistics missile (I.C.B.M.), a powerful rocket (q.v.) with a nuclear warhead, and the nuclear-powered submarine as a launching platform for ballistic missiles. These formidable weapons made warfare so lethal and all-embracing that nations returned to the lesser dangers of limited warfare, voluntarily refraining from using the means of destruction at their disposal; see DISARMAMENT; INTERNATIONAL CONTROL OF ATOMIC ENERGY.

At the same time, increased use was made of psychological warfare, which aimed at destroying an enemy's will to resist. Strategic bombardment, although essentially directed at eliminating military installations and industrial resources, has been effectively utilized as a psychological weapon. New to 20th-century warfare has been the use of so-called brainwashing techniques, by which new patterns of behavior can be implanted, often permanently, after first weakening the individual's mind and body through prolonged fatigue, discomfort, malnutrition, and anxiety. These techniques have been extensively applied in Communist countries as an effective means of dealing with political offenders and prisoners of war.

In recent years, the Korean War (q.v.) and the war in Vietnam (q.v.) have been examples of a trend toward warfare that is carefully controlled so as to avoid the catastrophe of an atomic war.

For the types of war and the principles governing the declaration of war, see WAR; WAR, DECLARATION OF. For more information supplementary to this article, see such entries as EDUCATION, MILITARY; INTELLIGENCE, MILITARY; MILITARY LAW; SELECTIVE SERVICE. See also ARMY; NAVY; and separate articles on the armed forces of the U.S., for example, UNITED STATES AIR FORCE. M.B. **WARHOL, Andy** (1930?–), American artist and motion-picture producer, probably born in

Philadelphia, Pa. He was educated at Carnegie Institute of Technology. After several years as a commercial artist, he began to attract attention early in the 1960's with exhibitions of his pop art (q.v.) objects, including huge soup cans and scale models of soap-pad cartons, capable of mass reproduction via a silk-screen process. At the same time he began to produce amateur motion pictures with his friends. Among the first to be labeled "underground films", these motion pictures grew gradually more complex. In 1966 his *The Chelsea Girls*, seven hours of virtually unedited semidocumentary film, was exhibited in a commercial theater in New York City, as two films projected simultaneously side by side by two projectors. Similar experimental films produced by Warhol and his associates since 1966 have achieved commercial exhibition in the United States and Europe, although they often encounter censorship problems. *Lonesome Cowboys* (1969), *Flesh* (1969), and *Trash* (1970) have all continued the Warhol tradition of improvised dialogue, lack of plot, freedom of subject matter and language, and frequent total nudity of the performers.

WARNER, name of four American motion-picture executives who were brothers: **Harry M(orris) Warner** (1881-1958), **Albert Warner** (1884-1967), **Samuel L(ewis) Warner** (1887-1927), and **Jack L(eonard) Warner** (1892-1978).

The three older brothers were born in Poland and the youngest was born in London, Ontario, Canada. By 1903 they had opened a nickelodeon in New Castle, Pa. In 1912 the Warners began to produce films in New York City. They opened their own studio in Hollywood, Calif., in 1918, and five years later, Warner Bros. Pictures, Inc., was founded. In the mid-1920's the brothers acquired the Vitagraph Company, enabling them to distribute their films directly to theaters. In 1926 they purchased Vitaphone, a process by which sound could be synchronized with silent film. They first used the Vitaphone system in a feature film during several musical numbers in *The Jazz Singer* (1927), thus revolutionizing the film industry. Early in the 1930's the brothers purchased the Stanley Company, owner of 250 theaters, and First National Pictures, with huge studios in Burbank, Calif. Among the stars developed by Warner Bros. were the American entertainers James Cagney, Bette Davis, Paul Muni, and Humphrey Bogart (qq.v.). The company produced more than 1500 films. Three won awards from the Academy of Motion Picture Arts and Sciences as best picture of the year: *The Life of Emile Zola* (1937), *Casablanca* (1943), and *My Fair Lady* (1964). Other famous Warner

Bros. films were *Little Caesar* (1930), *42nd Street* (1933), *Sergeant York* (1941), *Giant* (1956), and *Who's Afraid of Virginia Woolf?* (1966). In 1967 the company was purchased by Seven Arts Productions Limited.

WARNER, Glenn Scobey, known as "POP" **WARNER** (1871-1954), American football coach, born in Springville, N.Y., and educated at Cornell University. Warner was one of the outstanding football coaches of his time, active for forty-five years. The universities, colleges, and schools at which Warner coached include the University of Georgia (1895-96); Cornell University (1897-98 and 1904-06); the Carlisle (Pa.) Indian Industrial School (1899-1903 and 1907-14), which he brought to a high place in football ranks; the University of Pittsburgh (1915-23); Stanford University (1924-32); and Temple University (1933-39). He was advisory coach at the San Jose (Calif.) State College from 1940 to 1945, when he retired. Among the outstanding players Warner developed at Carlisle was the All-American halfback James Francis ("Jim") Thorpe (q.v.). Warner is also credited with originating the single and double wingback formations; see FOOTBALL, AMERICAN.

WARNER, Seth (1743-84), American Revolutionary hero, born in Woodbury (now Roxbury), Conn. He moved in 1763 to Vermont, known at that time as the "New Hampshire grants", and became prominent among a group of settlers forcibly resisting a New York claim to the area; see VERMONT: *History*. The General Assembly of New York declared him an outlaw in 1771 and offered a reward for his capture. Under the American Revolutionary officers Ethan Allen (see under ALLEN) and Benedict Arnold (q.v.), he participated in the seizure of Ticonderoga (q.v.) on May 10, 1775; he himself led the force that took nearby Crown Point the next day. Later that year he was elected lieutenant-colonel commandant of the Green Mountain Boys (q.v.). He served on the Canadian border in 1776, and in 1777 fought several rear guard actions near Lake Champlain. The timely arrival of his regiment in the Battle of Bennington in August, 1777, is generally agreed to have helped secure the American victory there; see BENNINGTON, BATTLE OF. Warner was appointed brigadier general by the Vermont Assembly in 1778.

WARNER, Sylvia Townsend (1893-1978), British poet and novelist, born in Harrow (now in London), England, and privately educated. At first interested in, and an editor of, books on Tudor music, she published her first collection of poems, *The Espalier*, in 1925 and her first novel, *Lolly Willowses*, in 1926. Both her poetry and fic-

tion are notable for their polished delicacy and wit. Many of her shrewd, concisely written stories and novels deal with fanciful or supernatural themes, including the occult and witchcraft. In 1927 she worked in New York City as guest-critic for the *Herald Tribune*, and during the Civil War in Spain she was active in supporting the Loyalist cause. Among her later novels are *The Cat's Cradle Book* (1960), *Boxwood* (1960), *A Spirit Rises* (1962), *A Stranger With a Bag* (1966), and *Swans on an Autumn River* (1966). She also satirized the Don Juan legend in *After the Death of Don Juan* (1938).

WARNER ROBINS, city of Georgia, in Houston Co., about 12 miles s. of Macon. The city is in a fruit, grain, and livestock area. The principal industries include machine shops and aircraft parts. The Robins Air Force Base is nearby. The University of Georgia has a campus here. Warner Robins was incorporated as a city in 1943. The city is named after Brigadier General Augustine Warner Robins (1882-1940), one of the organizers of the United States Air Corps. Pop. (1960) 18,633; (1970) 33,491.

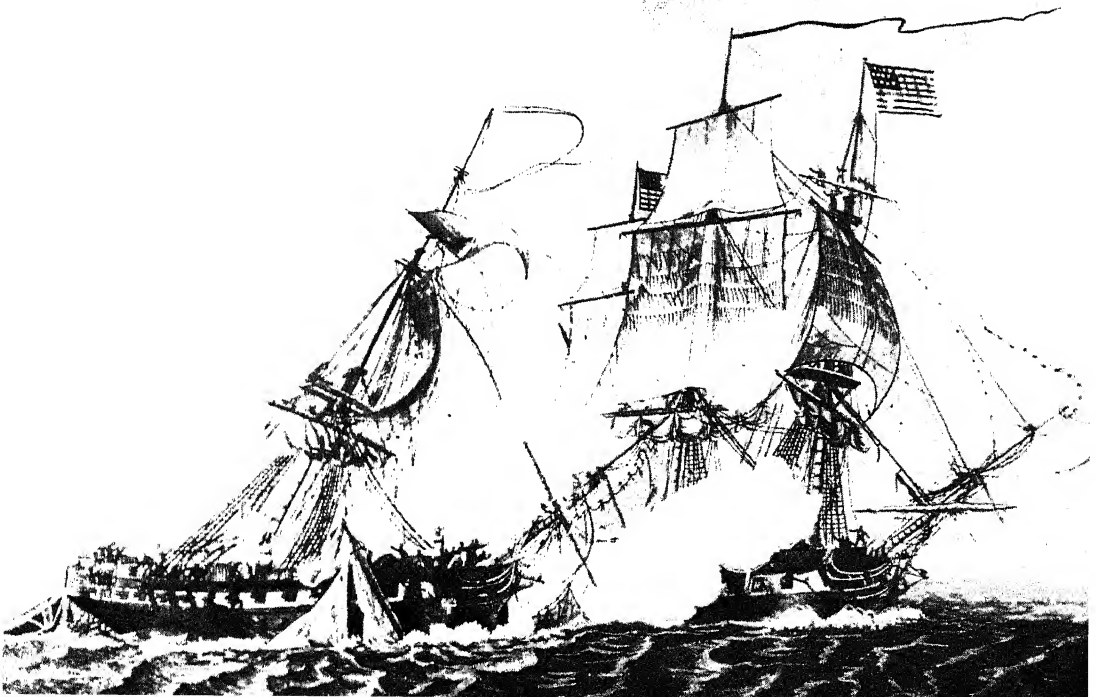
WAR OF 1812, conflict between the United States and Great Britain from 1812 to 1815. Fought over the maritime rights of neutrals and U.S. desire for land, it ended in compromise.

Background. In the French Revolutionary and Napoleonic Wars between France and Great Britain, both belligerents, fighting for survival, overrode the maritime rights of neutral powers. The U.S., trying to sell its foodstuffs to both, was

particularly harmed. Through impressment (q.v.), Britain seized deserters and other British citizens, including naturalized Americans of British origin, from American ships for service in the Royal Navy. From 1802 to 1812 some 10,000 Americans were impressed, causing an outrage in the U.S. In addition, through Orders in Council, Britain first blockaded the French coast and then ordered the seizure of any vessel sailing for Europe that did not first call at a British port. French policy was hardly an improvement, for Napoleon I in the Berlin and Milan decrees declared a blockade of Britain and ordered the capture of any ship stopping there en route to the Continent. Thus, American shipping was subject to attack by either belligerent. Relations approached the breaking point in 1807 when the British frigate *Leopard* illegally fired on the U.S. frigate *Chesapeake* and removed four men, including three U.S. citizens.

The American President, Thomas Jefferson, reacted with economic coercion rather than war. At his wish, Congress passed the Embargo Act of 1807 (q.v.), which prohibited virtually all U.S. ships from sailing overseas. Because the act seriously damaged the American economy, it was replaced by the Non-Intercourse Act of 1809, which forbade U.S. trade only with Britain and France. In 1810, under President James Madison, Macon's Bill No. 2 allowed trade with all nations but provided that if only one belligerent

U.S. Captain Isaac Hull in the Constitution captures the British frigate Guerrière in the War of 1812.



WAR OF 1812, THE

erent rescinded its antineutral decrees, the U.S. would impose an embargo against the one that did not. Napoleon then announced, falsely, the repeal of the Berlin and Milan decrees, causing Madison reluctantly to ban trade with Britain.

The Congressional elections of 1810 had returned a vigorous new group of young men to Washington, D.C. Drawn largely from the South and West, these War Hawks, including Henry Clay, John C. Calhoun, and Felix Grundy, wanted more land for settlement. Calling for war with Britain to defend American sovereignty and honor, they proposed an attack on Canada both to affront Britain and to stop British support of the Indians, who under the Shawnee chief Tecumseh (q.v.) opposed American westward expansion. The War Hawks also wanted to annex Florida, held by Britain's ally, Spain. Thus, on June 18, 1812, Congress declared war.

Armed Conflict. Operations began near the Canadian border. The swift action of British General Isaac Brock led to the American surrender of Detroit and Fort Michilimackinac and the complete defeat of the ill-prepared American army at Queenston Heights, near Niagara. The next year, on Sept. 10, an American naval squadron under Oliver Hazard Perry (*see under* PERRY) captured the British fleet on Lake Erie. On Oct. 5 the troops of William Henry Harrison (q.v.) defeated a combined force of British and Indians in the battle of the Thames, just north of Lake Erie. The Americans then burned York (Toronto), capital of Upper Canada. Rising American hopes were dashed, however, by failure to take Montréal. Furthermore, despite victories of single American ships in the Atlantic, such as that of the *Constitution* over the *Guerrière* in 1812, the Royal Navy succeeded in blockading the entire eastern coast. U.S. trade was ruined. In addition, the defeat of Napoleon in 1814 freed Britain to send more seasoned troops to North America.

Nevertheless, by 1814, the quality of American troops and the vigor and skill of their leaders had improved markedly. That summer American forces under Jacob Brown and Winfield Scott withstood heavy British assaults at Chippewa and Lundy's Lane, near Niagara. On Sept. 11 an American naval victory on Lake Champlain forced 15,000 invading British troops to retreat to Canada. Farther south, on the coast, the British sailed 35,000 troops from Bermuda to Chesapeake Bay, where they defeated a much larger force at Bladensburg and proceeded to burn the Capitol and White House in Washington in retaliation for the American attack on York. They failed, however, to take Baltimore. During the

British bombardment of the city, Sept. 13–14, the American poet Francis Scott Key (q.v.), who was being held aboard a British ship, wrote "The Star-Spangled Banner", which became the U.S. national anthem.

Conclusion. The Americans' victory on Lake Champlain, followed by their defense of Baltimore, were critical battles because they encouraged the British prime minister, Lord Liverpool, to consider peace. Treaty negotiations were begun as early as 1813, but the military stalemate accelerated the tempo of bargaining. At first both sides made unrealistic demands—the U.S. wanted Britain to end all offensive maritime practices, and Britain demanded a neutral Indian buffer state to be carved out of the American Northwest. Since neither side had won the war, they compromised by returning to the status quo ante bellum. A peace treaty was signed at Ghent, Belgium, on Dec. 24, 1814, and ratified by the Senate Feb. 16, 1815. Between these dates a last battle was fought on Jan. 8, when a British army, landed at the mouth of the Mississippi R., was routed in the battle of New Orleans by U.S. forces under General Andrew Jackson (q.v.).

The treaty did not secure U.S. maritime rights, but the end of the Napoleonic Wars meant that they were no longer threatened. Britain never impressed American seamen again. The U.S. did not win Canada, but Indian opposition to expansion was broken, and Florida was soon ceded by Spain. The U.S. emerged from the war with a new sense of national purpose. Canadians also gained increased national awareness and a heightened distrust of republican institutions. P.C.T.W.

WAR OF SECESSION. *See* CIVIL WAR, THE AMERICAN.

WAR OF THE PACIFIC. *See* BOLIVIA: *History: Boundary Disputes*; CHILE: *History: Growing Liberal Opposition*; PERU: *History: 19th Century*.

WARRANT. *See* ARREST; SEARCH WARRANT.

WARRANTY, in the law of contracts in the United States, an undertaking expressed or implied, given by one contracting party to another that a fact alleged with respect to the subject matter of the contract is as represented. An example of a warranty is that made in a warranty deed (*see* COVENANT) whereby the seller covenants that he has title to the property and that the property is free from encumbrances. A breach of warranty results from the failure of the subject matter of the contract to conform to the facts as represented, giving the injured party a cause of action for the breach.

WARREN, city of Michigan, in Macomb Co., adjoining Detroit on the N. and 12 miles N.E. of

the downtown area. Manufactures include steel and steel products, industrial equipment, motor vehicles, metal products, paper and plastic products, chemicals, abrasives, and electrical equipment. Warren is the site of Macomb County Community College (junior college; 1954), the General Motors Technical Center, and the Detroit Tank Arsenal. Organized as Hickory township in 1837, the area was renamed Aba the next year and Warren shortly thereafter. It became a village in 1893 and a city in 1955. Pop. (1960) 89,246; (1970) 179,260.

WARREN, city in Ohio, and county seat of Trumbull Co., on the Mahoning R., about 15 miles N.W. of Youngstown. It is served by several railroads, and is an important manufacturing center in the Ohio-Pennsylvania steel-producing area. Industrial establishments in the city include extensive steel plants and factories manufacturing appliances, aluminum, and automobiles. Warren was settled about 1798, incorporated as a village in 1834, and chartered as a city in 1869. Pop. (1960) 59,648; (1970) 63,494.

WARREN, borough in Pennsylvania, and the county seat of Warren Co., on the Allegheny R., about 55 miles S.E. of Erie. Manufactures include electrical equipment, metal and petroleum products, and furniture. Warren is the headquarters for the nearby Allegheny National Forest. Also nearby is the Cornplanter Indian Reservation. Warren was established about 1795 and was incorporated as a borough in 1832. Pop. (1960) 14,505; (1970) 12,998.

WARREN, Earl (1891–1974), American jurist and political leader, born in Los Angeles, Calif., and educated at the University of California. Admitted to the bar in 1914, Warren practiced law in San Francisco and Oakland and held various offices in local government. During the period 1925–38 he served three terms as district at-

torney of Alameda County. A member of the Republican Party, Warren was elected attorney general of California in 1938. During his four-year term in office, Warren increased an already established reputation as a strong foe of gamblers and racketeers. In 1942 he was elected governor of California. His progressive policies won him wide support in both the Republican and Democratic parties; in 1946 he was re-elected governor, having been nominated by both parties. In 1948 Warren was the Republican candidate for the Vice-Presidency and the running mate of the Presidential candidate Thomas Edmund Dewey (q.v.) in an unsuccessful campaign.

Reelected governor in 1950, Warren resigned in 1953 to become chief justice of the United States, to which post he was appointed by President Dwight David Eisenhower (q.v.). In 1968 Warren submitted his resignation as chief justice to President Lyndon Baines Johnson (q.v.). The appointment by Johnson of Abe Fortas (q.v.) to replace Warren provoked a filibuster in the United States Senate to block the confirmation vote. Subsequently, Fortas requested his name be withdrawn; the President complied and Warren agreed to remain on the high bench until June, 1969, the end of the Court term. Many decisions of great consequence were handed down during the tenure of Warren as chief justice, particularly in the areas of civil rights, religious freedom, and censorship. Warren was chairman of the Presidential commission formed in 1963 to investigate the assassination of President John Fitzgerald Kennedy (q.v.). The findings of the commission were published in the Warren Report (q.v.).

See CIVIL RIGHTS AND CIVIL LIBERTIES; SUPREME COURT OF THE UNITED STATES.

WARREN, Joseph (1741–75), American patriot, born in Roxbury, Mass., and educated at Har-

*Chief Justice Earl Warren
in front of the Supreme
Court building in Wash-
ington, D.C.*

George Tames
NEW YORK TIMES



vard College. Following the passage of the Stamp Act (q.v.) in 1765, he became a leader of the anti-British party. In 1774 Warren took part in drafting the Suffolk Resolves, which urged forcible opposition to Great Britain. Warren was a member of the first three provincial congresses of Massachusetts (1774–75), was president of the third, and was a prominent member of the committee of public safety. He became a major general on June 14, 1775, during the American Revolution (q.v.), and three days later he was killed in the Battle of Bunker Hill; see BUNKER HILL, BATTLE OF.

WARREN, Robert Penn (1905–), American novelist, poet, and critic, born in Guthrie, Ky., and educated at Vanderbilt University and the University of California. In 1930 he received a Rhodes scholarship for advanced study at the University of Oxford. From 1935 to 1942 Warren and the American critic Cleanth Brooks (1906–) edited *The Southern Review*, a journal of literary criticism and political thought. Brooks and Warren belonged to the group of critics known as the New Critics, who stressed close reading and interpretation of the texts; the two collaborated on textbooks on criticism, including *Understanding Poetry* (1938) and *Understanding Fiction* (1943). Warren is best known for his novel *All the King's Men* (1946), a character study of a powerful southern governor resembling the American politician Huey Pierce Long (see under LONG). For this novel, Warren received the 1947 Pulitzer Prize for fiction, and the book was made into a motion picture which won the best-film award of the American Academy of Motion Picture Arts and Sciences in 1949. Warren won the Pulitzer Prize as well as the National Book Award for his collection of poems *Promises* (1958), a volume that illustrated his use of intense symbolism. Other books of verse include *You, Emperors and Other Poems* (1960) and *Selected Poems, New and Old, 1923–1966*, which was published in 1966 and for which he received the 1967 Bollingen prize for poetry, awarded biennially by Yale University. *Incarnations: poems, 1966–1968* was published in 1969. Warren's prose and poetry reflect his concern for maintaining human dignity in the face of corruption and abuse of power. Some of his other novels include *Night Rider* (1939), *World Enough and Time* (1950), *The Cave* (1959), *Flood* (1964), and *Who Speaks for the Negro?* (1965). Since 1961 he has been professor of English at Yale University.

WARREN REPORT, the report and conclusions of a seven-member commission headed by Earl Warren (q.v.), then chief justice of the

United States Supreme Court. The commission was concerned with the circumstances of the assassination of President John Fitzgerald Kennedy (q.v.) in Dallas, Texas, on Nov. 22, 1963, and the murder, two days later of Kennedy's accused assassin, Lee Harvey Oswald (1939–63), by a nightclub operator, Jack Ruby (1911–67). The 296,000-word report is based on 24 volumes of testimony taken by the commission over a period of several months following the assassination.

The commission, named by President Lyndon Baines Johnson (q.v.) seven days after the assassination, carried out an exhaustive investigation and submitted its report the following year, on Sept. 24, 1964. Its main conclusions were that Oswald, self-styled Marxist and a former private in the United States Marine Corps "acting alone and without advice or assistance", had fired the shots that killed President Kennedy and wounded Governor John Bowden Connally, Jr. (1917–), of Texas, as they were riding in an open car, and that there was "no evidence that either Lee Harvey Oswald or Jack Ruby was part of any conspiracy, domestic or foreign, to assassinate President Kennedy. . . ."

The commission also concluded that "the possibility of others being involved with either Oswald or Ruby cannot be established categorically, but if there is any such evidence it has been beyond the reach of all the investigative agencies of the United States and has not come to the attention of this Commission".

The report, however, did not end all rumors and speculation about the possibilities that others were involved in the assassination or that there was, indeed, a plot to assassinate the President.

Members of the Warren Commission, besides the chief justice, were U.S. Representative Gerald R. Ford, Jr. (1913–); Representative Thomas Hale Boggs (1914–72); Senator Richard Brevard Russell, Jr. (1897–1971); Senator John Sherman Cooper (1901–); John Jay McCloy (1895–), former president of the World Bank; and Allen Welsh Dulles (see under DULLES), former director of the Central Intelligence Agency. James Lee Rankin (1913–), former solicitor general of the U.S., was chief counsel.

WARRENSVILLE HEIGHTS, city of Ohio, in Cuyahoga Co., a suburb about 9 miles E. of central Cleveland. Primarily residential, the city has some manufacturing. Warrensville Heights was settled in 1808 and incorporated in 1927. Pop. (1960) 10,609; (1970) 18,925.

WARRINGTON, Great Britain, county borough of Lancashire, England, on the Mersey R.,



Modern apartment houses in the center of Warsaw, which was virtually destroyed in World War II. UPI

18 miles E. of Liverpool. The rail center of the surrounding industrial region, Warrington also has tanneries and manufacturing plants producing a variety of products. Pop. (1971) 68,262.

WARSAW (Pol. *Warszawa*), largest city and capital of Poland, and capital of Warsaw Province, on the Vistula R., about 70 miles N.E. of Łódź, and 325 miles E. of Berlin, Germany. The city is the hub of highway and railroad networks that connect it with all parts of Poland and with other major cities of Europe.

A Center of Culture. Warsaw was for centuries the political and cultural center of Poland. Almost totally destroyed during World War II, the city has been reconstructed and its area greatly extended. The Old City, which has been restored, centers on the medieval market square, situated near the river and surrounded by Renaissance and baroque houses. To the S. of the square is the Barbican, a relic of the medieval fortifications. Farther S., on an island in Łazienki Park, is the Palace on the Water, built in the 18th century as the summer palace of Stanislas II Augustus (q.v.), last king of Poland. Łazienki Park is also the site of a monument to the Polish composer Frédéric François Chopin (q.v.). To the N., W., and S. of the Old City, wide tree-lined avenues, large modern apartment buildings, shopping plazas, and parks have been built since 1945. The park system of the city covers more than 4000 acres.

Warsaw has many historic churches, notably the 14th-century Gothic Cathedral of Saint John, and the reconstructed 16th-century Church of the Holy Cross. Other outstanding structures include the modern Palace of Culture and Science and the 19th-century Grand Theater, which is devoted to opera and ballet. Monuments to famous men and events in Polish history include those to King Sigismund III (1566-1632), the astronomer Nicolaus Copernicus, and the poet Adam Mickiewicz (qq.v.). Two other monuments are dedicated, respectively, to the heroes of the Warsaw ghetto and of the Polish underground during World War II (q.v.); see GHETTO.

Among its cultural institutions, Warsaw has nearly thirty museums and numerous art galleries. The National Museum has a notable exhibit of antique Nubian paintings from Africa and a collection of Polish art from the 14th to the 20th centuries. Cultural activities include an annual international book fair and the international Frédéric Chopin piano competition, held every five years. Educational facilities include the University of Warsaw, founded in 1818, more than ten other institutions of higher education, and some thirty-five research institutes.

Commerce and Industry. Although 90 percent of the industry of Warsaw was destroyed in World War II, the rebuilt industrial region of the

WARSAW CONVENTION

city has nearly 4000 enterprises. The principal industries are printing and publishing and the manufacture of automobiles, electronic products, steel and other metals, textiles, television and radio sets, motorcycles, chemicals, tobacco products, processed foods, and furniture.

History. The city grew up, in the early 14th century, around the castle of the dukes of Masovia. In 1595, following the burning of Cracow, Warsaw became the capital of the Polish kingdom. Occupied several times by Sweden and Russia, the city passed to Prussia in 1795. Napoleon I (q.v.), Emperor of France, made it the capital of the Grand Duchy of Warsaw in 1807. From 1813 until its occupation by Germany in 1915, Warsaw was under Russian control. In 1918 it became the capital of the newly restored Polish state.

On Sept. 1, 1939, as World War II began, Warsaw was the victim of the first German air attack on a major city. The German armies captured the city on Sept. 27 after inflicting severe destruction by bombing and artillery attacks. Throughout the war the Polish capital was not only the headquarters of the German occupation authorities, but also the center of the Polish underground resistance. In the next four years the Germans carried out a calculated plan to annihilate the city. The Jews, numbering some 400,000, were the first victims. They were herded into a walled ghetto of less than 1 sq.mi. in area. Between July 22 and Oct. 3, 1942, more than 300,000 inhabitants of the ghetto were sent to concentration camps and killed. In April, 1943, the German troops attacked the ghetto, and the 70,000 remaining Jews were killed after a heroic resistance that lasted for three weeks.

On Aug. 1, 1944, as Soviet armies neared the city, the citizens of Warsaw rose against the Germans and fought for sixty-three days before they were finally defeated. Following the uprising, German troops killed or deported most of the remaining population. Thereafter special forces carried out a systematic destruction of the city. Warsaw was liberated by Soviet and Polish troops in January, 1945. After the war the city was rebuilt, with the aid of gifts from other countries. Where possible, the original plans were followed in the reconstruction of historical buildings and districts.

Population. Of a prewar population of more than 1,000,000, only some 162,000 survived the war, living in Praga east of the river, and in the western suburbs. In 1971 the population of Warsaw was estimated at 1,308,900.

WARSAW CONVENTION. See AIR LAW: *International Law*.

WARSAW TREATY ORGANIZATION, mutual-defense alliance of seven European Communist nations: Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the Soviet Union. The treaty establishing the organization, also known as the Warsaw Pact, or Eastern European Mutual Assistance Treaty, which created the twenty-year alliance, was signed by these nations and Albania in Warsaw, Poland, on May 14, 1955. The specific purpose of the Warsaw Pact was to counter the rearmament of West Germany and its admission to the North Atlantic Treaty Organization (q.v.). In 1961 Albania broke off diplomatic relations with the U.S.S.R. over ideological differences, and since January, 1962, Albania has been excluded from pact meetings.

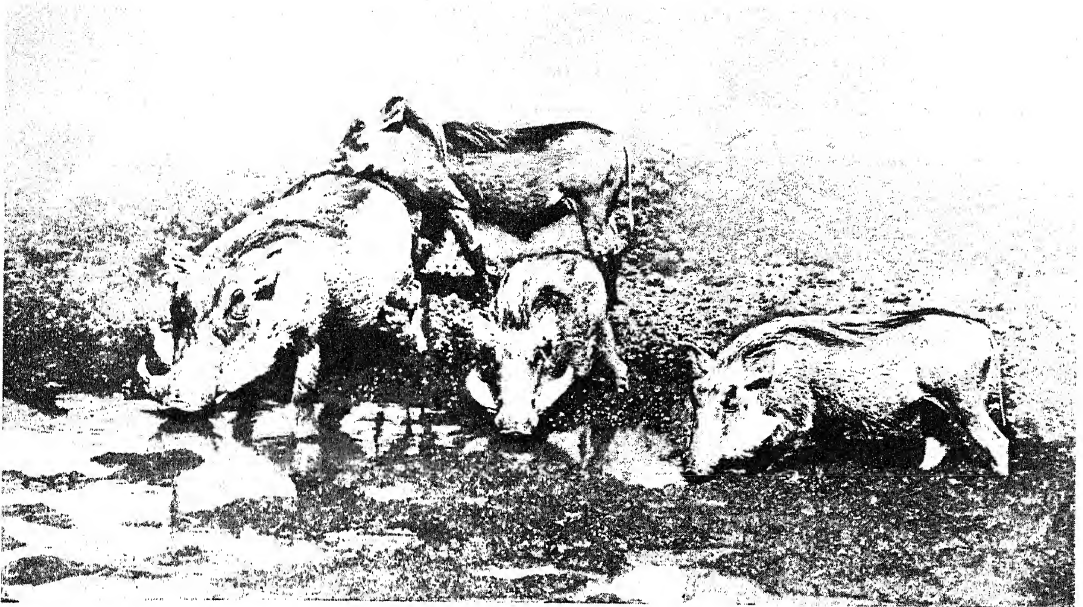
Two major bodies carry out the functions of the pact: the Political Consultative Committee and the Unified Command of Pact Armed Forces, both with headquarters in Moscow. According to the terms of the treaty the Political Consultative Committee coordinates all activities with the exception of purely military matters, and the Unified Command of Pact Armed Forces has authority over the troops assigned to it by the member states of the pact.

The main task of the Unified Command is to "strengthen the defensive capability of the Warsaw Pact, to prepare military plans in case of war, and to decide on the deployment of troops". The Warsaw Pact conference agreed that the supreme commander of the armed forces of the treaty organization would be from the Soviet Union. The total troop strength committed to the pact in the late 1960's was estimated at between 900,000 and 1,000,000 men.

On Aug. 20, 1968, more than 140,000 Soviet troops, plus about 60,000 troops from other Warsaw Pact nations, invaded Czechoslovakia. According to the Soviet Union, the reason for the invasion was that the socialist system of Czechoslovakia (q.v.) was threatened by counterrevolutionary forces. As a result of the action, two recent Czechoslovak reforms, liberation of the press and the right to form non-Communist political organizations, were nullified.

WARS OF THE ROSES. See ROSES, WARS OF THE. **WART,** or VERRUCA, small, benign, circumscribed tumor of the outer or horny layer of the skin. Warts are flat or elevated from the surrounding skin and are firm. They vary in size, are caused by viruses, and may be accompanied by pain, particularly if they occur on the feet (plantar warts).

Treatment involves the use of local medication. If the wart reoccurs, it may be treated by



Warthogs, *Phacochoerus aethiopicus*, at a waterhole in Kruger National Park, Republic of South Africa. Satour

freezing with dry ice, X ray, burning with an electric needle, or surgical removal. Plantar warts tend to be very hard to treat and remove. L.J.V.

WARTHOG, large, bush-ranging, wild pig of Africa, *Phacochoerus aethiopicus*. It inhabits most of Africa, the greatest concentration being in the east and south. The warthog has a very long and broad head with enormous tusks. The face has pairs of wartlike protuberances on each side of the nose, with one pair just below the eyes. See BOAR; HOG.

WARWICK, city of Rhode Island, in Kent Co., on the Pawtuxet and Providence rivers, at the head of Narragansett Bay, 6 miles s. of Providence. Transportation facilities include a railroad and airplane service. Warwick is principally a residential community. Its textile industry dates from 1794. Other industries include the manufacture of pipe fittings, stapling machines, and brass castings and moldings. The city is also a shipping point for clams, oysters, and scallops.

The first settlement at the site was established in 1648 by the English minister Samuel Gorton (1592?-1677) and named by him after the earl of Warwick, who had assisted him in gaining a royal charter. It was the birthplace of the American general Nathanael Greene (q.v.), one of the heroes of the American Revolution (q.v.).

About 7 miles w. of Warwick, on the Pawtuxet R., is the town of West Warwick, also a textile center. Originally a part of Warwick, the town

was incorporated separately in 1913. Pop. (1960) 21,414; (1970) 24,323.

Warwick was chartered as a city in 1931. Pop. (1960) 68,504; (1970) 83,694.

WARWICK, Earl of, Richard Neville. See NEVILLE, family.

WARWICKSHIRE, Great Britain, midland county of England, traversed by the Avon R. The county has several agricultural and industrial regions. In the s. livestock is raised, in the Avon valley grains and vegetables are grown, and in the n. is a mixed-farming area. Birmingham and Coventry (qq.v.), in the n.w. and n.e., respectively, are important industrial centers with coalfields located nearby. Area, 983 sq.mi.; pop. (1971) 2,079,799.

WASATCH MOUNTAINS, range within the Rocky Mountain system. About 150 mi. long, it begins in s.e. Idaho, and runs southward e. of the Great Salt Lake and through the center of Utah, gradually turning to the s.w., and ending at the s.w. corner of the State. The average height of the range is about 10,000 ft., and several of its peaks are more than 12,000 ft. high.

WASH, THE, narrow inlet of the North Sea (q.v.) off the coast of England, located between the counties of Lincolnshire and Norfolk. The river ports of Boston and King's Lynn are situated on the Wash, which is a shallow, estuarine area about 20 mi. long and 15 mi. wide. The inlet is also a popular fishing ground, with the Nene, Ouse, Welland, and Witham rivers flow-

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ing into it. A large acreage of the marshy banks of the Wash has recently been reclaimed and put to agricultural use.

WASHINGTON, Pacific State of the United States, bounded on the N. by the Canadian province of British Columbia; on the N.W. by Juan de Fuca Strait, Puget Sound, and Haro Strait; on the E. by Idaho; on the S. by Oregon; and on the W. by the Pacific Ocean. Washington is roughly rectangular in shape, measuring about 330 mi. from E. to W. and about 220 mi. from N. to S.

Area (20th State in rank)	68,192 sq. mi.
Land	66,570 sq. mi.
Inland water	1622 sq. mi.
Population	(1970, 22nd in rank) 3,409,169
	(1960, 23rd in rank) 2,853,214
	(1950) 2,378,963
Altitude	sea level to 14,410 ft.
Capital	Olympia (1970) 23,111
Largest city	Seattle (1970) 530,831
Entered Union (42nd State)	Nov. 11, 1889
Nickname	The Evergreen State
Motto	Alki (By and By)
Song	"Washington, My Home"
Flower	western rhododendron
Bird	willow goldfinch
Tree	western hemlock

THE LAND

Washington is divided into two main regions by the Cascade Range (q.v.), which traverses the

State from N. to S. Eastern Washington comprises about three fifths of the area, and W. Washington encompasses the remainder. The Cascades vary in width from 50 mi. in the S. to more than 100 mi. at the Canadian border; the peaks average 8000 ft., and few of the passes are below 6000 ft. Six glacier-covered, extinct volcanoes tower above the general level of the range. These include Mt. Rainier (14,410 ft.), the highest point in the State and the fourth-highest peak in the U.S., and Mt. Adams (12,307 ft.), Mt. Baker (10,778 ft.), Glacier Peak (10,436 ft.), Mt. Saint Helens (9677 ft.), and Mt. Stuart (9470 ft.). Between the Cascades and the Coast Range (q.v.) to the W. is the Puget Sound basin, a longitudinal depression with a maximum altitude of 500 ft. The basin, which extends virtually the length of the State, is penetrated through more than half its length by the numerous branching arms of Puget Sound (q.v.). The Strait of Juan de Fuca connects Puget Sound with the Pacific Ocean. Hood Canal, a narrow, fishhook-shaped fiord, projects about 60 miles S.W. from Puget Sound. The sound contains numerous islands, of which Whidbey Island is the largest. Although the general coastline measures only 157 mi., the overall length of the coastline, measured around

Aerial view of Olympia, capital of Washington State.
Washington State Dept. of Commerce



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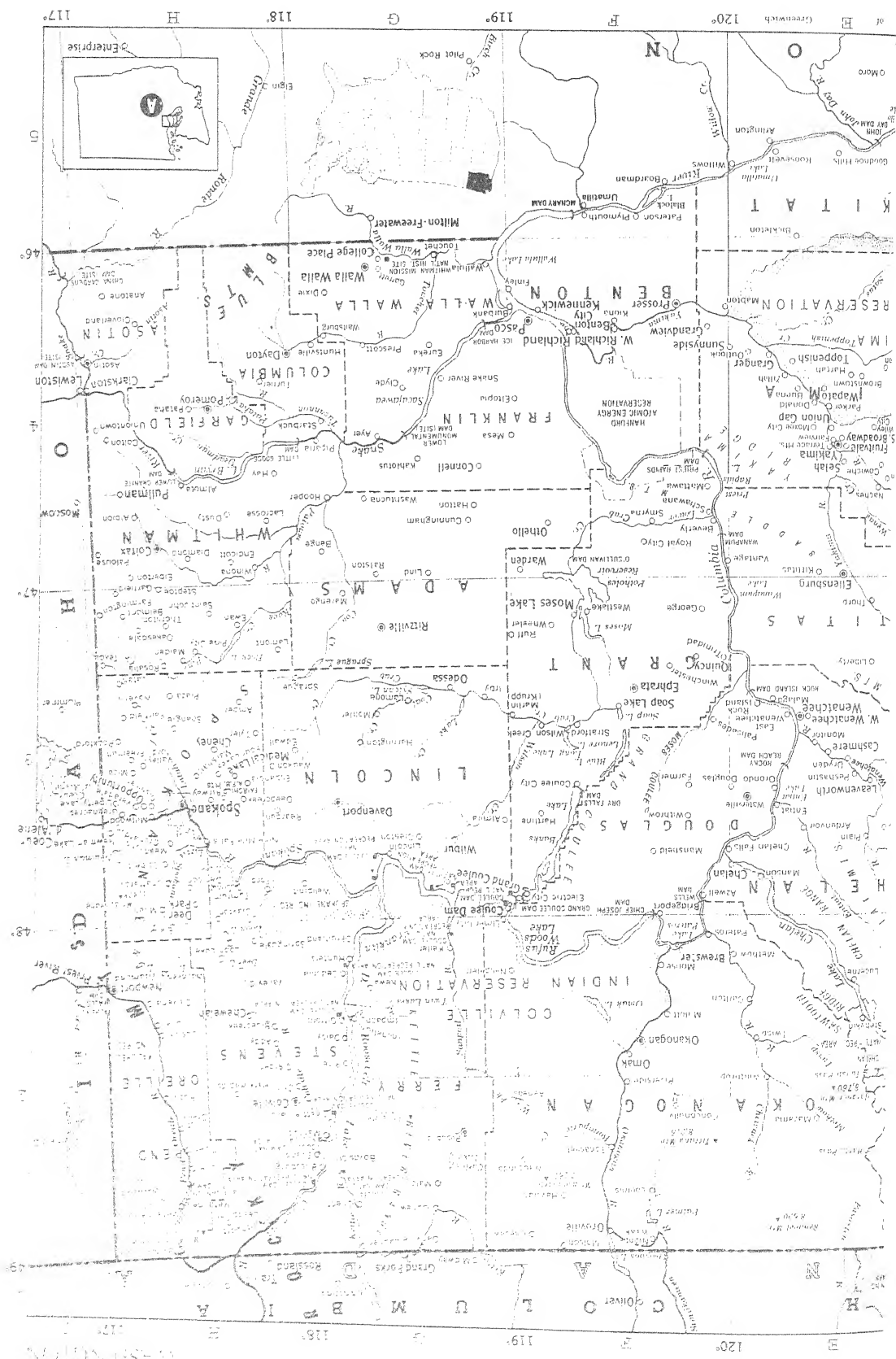
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○ County seat.

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Sawtooth (ridge).....	E 2
Shoalwater Ind. Res.....	B 4
Simikameen (riv.).....	F 1
Skagit (riv.).....	C 2
Skokomish Ind. Res.....	B 3
Skykomish (riv.).....	D 3
Snake (riv.).....	G 4
Snohomish (riv.).....	C 3
Snoqualmie (riv.).....	D 3
Soap (lake).....	F 3
Soteduck (riv.).....	A 3
Spirit (lake).....	C 4
Spokane (riv.).....	H 3
Spokane Ind. Res.....	G 3
Sprague (lake).....	G 3
Suattie (riv.).....	D 2
Sullivan (lake).....	H 2
Swift Creek (res.).....	C 4
Swinomish Ind. Res.....	C 2
The Dalles (dam).....	D 5
Tieton (riv.).....	D 4
Toft River (res.).....	D 3
Touchet (riv.).....	G 4
Tucannon (riv.).....	G 4
Tulalip Ind. Res.....	C 2
Twisp (riv.).....	E 2
Umatilla (lake).....	E 5
Union (lake).....	B 2
Vancouver (lake).....	C 5
Walla Walla (riv.).....	G 4
Wallula (lake).....	F 4
Wanapum (lake).....	E 3
Washington (lake).....	B 2
Wells (dam).....	F 3
Wenatchee (mts.).....	E 3
Wenatchee (riv.).....	E 3
Whatcom (lake).....	C 2
Whidbey I. N.A.S.....	C 2
White (riv.).....	D 3
White Salmon (riv.).....	D 4
Whitman Mission Nat'l Hist. Site.....	G 4
Willapa (bay).....	A 4
Wind (riv.).....	D 5
Wynoochee (lake).....	B 3
Yakima (riv.).....	F 4
Yakima Ind. Res.....	E 4
Yale (lake).....	C 4

islands and tidal bays, inlets, and estuaries, is 2846 mi. The lowest point in the State is at sea level, and the average elevation is 1700 ft.

The Coast Range traverses the State from s.e. to n.w. and increases in ruggedness and elevation toward the n. The s. portion of the range consists of broad irregular masses having a maximum elevation of about 3000 ft. The n. portion rises into a well-defined group called the Olympic Mts., whose highest peak, Mt. Olympus, is 7954 ft.

Eastern Washington, e. of the Cascades, consists of three main physiographic provinces: the fertile Columbia Plain, which occupies most of the s.e. and is famed as the "Inland Empire" of the State; the Okanogan Highlands, a w. extension of the Rocky Mts. in the n.e.; and the Blue Mts. in the extreme s.e. The Columbia Plain consists of a vast basaltic plateau, undulating and treeless, between 500 and 2000 ft. above sea level. The region is dissected by a number of river valleys and by depressions called coulees. The plains are bordered on the n. by the Columbia and Spokane rivers, which form the s. boundary of the Okanogan Highlands, a region of rolling hills that reach elevations exceeding 5000 ft. The Blue Mts., bordering the plains in the s.e., have elevations of more than 7000 ft.

Rivers and Lakes. The largest river in Washington is the Columbia River (q.v.), which drains the entire e. section of the State. Its principal tributaries are the Spokane, Pend Oreille, and Okanogan rivers in the n.e. and the Snake River (q.v.) in the s.e. The chief affluent of the Columbia from the e. slope of the Cascades is the Yakima R. Western Washington is drained by many comparatively small streams flowing into Puget Sound and the Pacific Ocean. The largest of those entering the sound are the Skagit R. in the n. and the Nisqually R. in the s. Lake Chelan, in n. Washington, is the largest lake in the State. The Grand Coulee Dam, a unit of the Columbia Basin Project on the Columbia R., has created Franklin D. Roosevelt Lake, a reservoir more than 150 mi. long. Other units of the project are Bonneville, McNary, John Day, and Chief Joseph dams and The Dalles on the Columbia R. and Ice Harbor and Lower Monumental dams on the Snake R.

Climate. The e. and w. parts of Washington vary widely in climate. West of the Cascade Mts. summers are cool and dry, and winters are mild, wet, and cloudy. Precipitation averages range from 20 in. to the n.e. of the Olympic Mts. to 150 in. on the s.w. slopes. Snowfall is light at lower elevations and heavy in the mountains. Thunderstorms are infrequent and hailstorms rare.

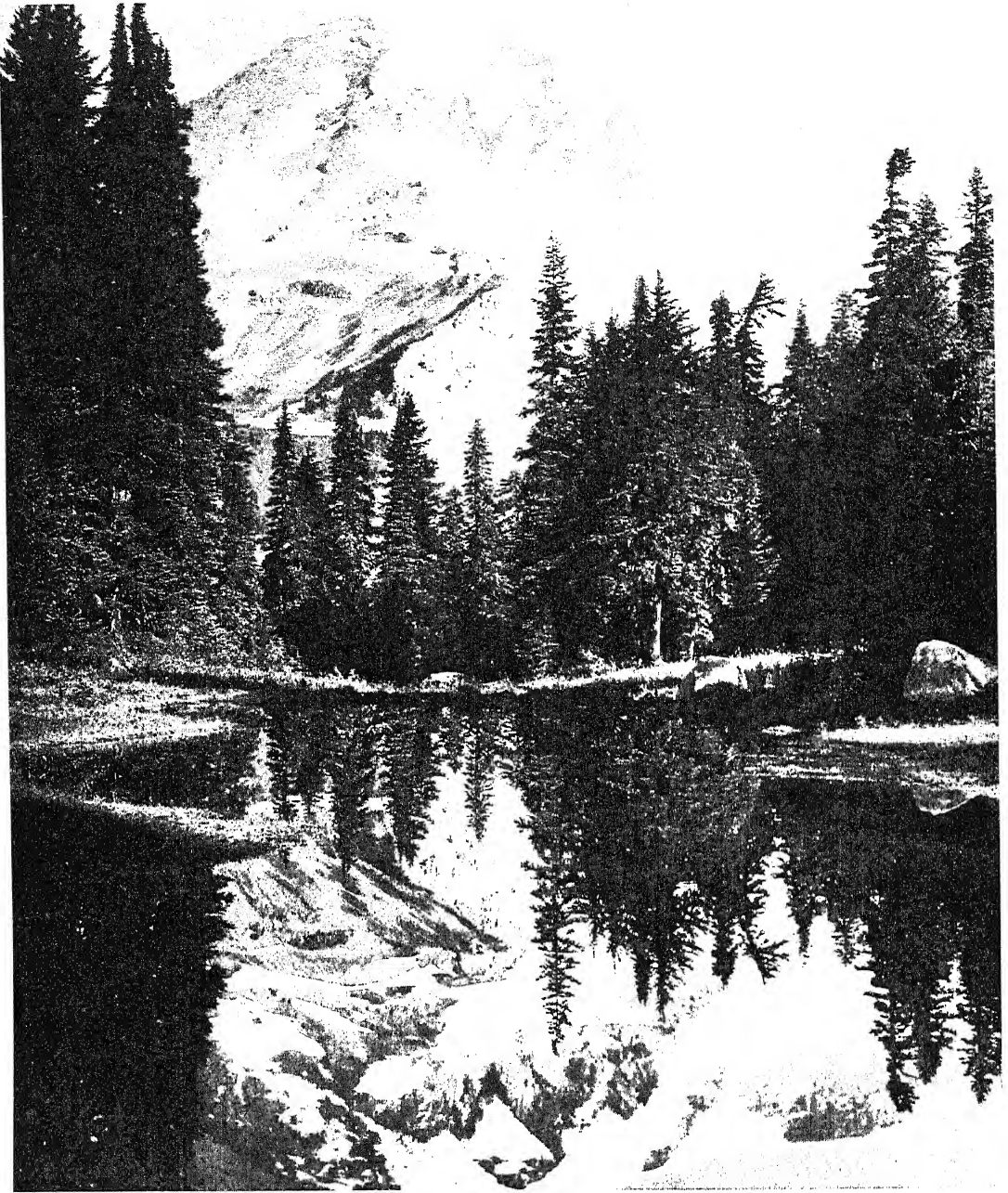
East of the Cascades, summers are warmer, winters are colder, and precipitation is less. Rainfall ranges from 7 to 9 in. near the confluence of the Snake and Columbia rivers, to 75 to 90 in. near the summit of the mountains. Thunderstorms are relatively frequent from April to September. The highest temperature recorded in the State was 118° F. (at Ice Harbor Dam); the lowest, -42° F. (near Deer Park).

Climate	Seattle-Tacoma	Spokane	Walla Walla
Normal temperatures (in ° F.)			
January maximum	43.4	31.1	39.3
January minimum	33.0	19.6	27.5
July maximum	75.1	84.3	88.9
July minimum	53.8	55.1	62.3
Annual	51.1	47.3	54.1
Normal precipitation (in inches)			
Wettest month	5.94	2.47	2.07
Driest month	.71	.40	.33
Annual	38.79	17.42	16.01
Latest frost	Feb. 23	April 25	March 27
Earliest frost	Nov. 30	Oct. 11	Nov. 2
Mean number of days between latest and earliest frosts	280	169	220

Plants and Animals. Western Washington from the coast to the Cascade Mts. has abundant vegetation. Huge Douglas fir, Sitka spruce, and ponderosa pine are mixed with hardwoods such as maple and western dogwood. Shrubs, including rhododendron and Oregon grape, are found in the w. forests. In contrast, the Columbia Plateau e. of the Cascades is treeless and supports only some greasewood, sagebrush, and rabbit bush. Farther to the e. the higher terrain supports a variety of grasses mixed with mountain phlox, anemone, valerian, and mariposa lily. Also e. of the Cascades are found cedar, juniper, laurel, and rose; cultivated species include ash, birch, maple, pine, spruce, hawthorn, lilac, spirea, and barberry.

Among large mammals indigenous to Washington are the puma or mountain lion, black bear, wildcat, mountain goat, wapiti or American elk, mule deer or black-tailed deer, and coyote. Some of the smaller mammals are the mink, marten, beaver, muskrat, long- and short-tailed weasels, striped and spotted skunks, squirrel, porcupine, chipmunk, gopher, and marmot. The only poisonous reptiles found in the State are rattlesnakes. The principal game birds are partridge, grouse, white-tailed ptarmigan, the introduced ring-necked pheasant, geese, and ducks. The turkey vulture, sparrow hawk, and prairie falcon are common birds of prey. A few golden and bald eagles are found. Shore and marsh birds include gull, sandpiper, coot, oyster catcher, tern, crane, cormorant, and pelican.

The most important fish economically are



Mount Rainier is reflected in Fairy Pool, in Mount Rainier National Park.
Rainier National Park Co.

salmon, large schools of which ascend the Columbia R. annually to spawn. Other fish found in fresh water are Dolly Varden trout, silver trout, rainbow trout, white sturgeon, whitefish, and squawfish. Saltwater fish include tuna, albacore, halibut, red snapper, cod, herring, flounder, and pilchard. Squid, octopus, starfish, and

jellyfish also are common. Shellfish include oysters, clams, mussels, scallops, crabs, and shrimp. **Parks, Forests, and Other Places of Interest.** Washington has three national parks. Mount Rainier National Park (q.v.) contains the greatest single-peak glacial system in the U.S. Olympic National Park (q.v.), near Port Angeles, is a mountain wilderness containing a remnant of the Pacific Northwest rain forest. North Cas-

cadates National Park, 1,200,000 acres in the region called the "American Alps", was authorized by the United States Congress in 1968. Fort Vancouver National Historic Site (q.v.), in Vancouver, contains archeological excavations, and a museum exhibiting artifacts uncovered in the archeological studies. Whitman Mission National Historic Site, near Walla Walla, commemorates the American medical missionary Marcus Whitman (q.v.). The Coulee Dam National Recreation Area (q.v.), near Grand Coulee, contains Franklin D. Roosevelt Lake. San Juan Island National Historical Park commemorates peace among the U.S., Great Britain, and Canada since the 1872 boundary dispute. Lake Chelan and Ross Lake national recreational areas are adjacent to North Cascades National Park. The seven national forests in Washington offer varied terrain, including peaks, glaciers, alpine lakes and meadows, rain forests, and historic sites. They are, with headquarters city in parentheses, Colville National Forest (Colville), Gifford Pinchot National Forest (Vancouver), Mt. Baker National Forest (Bellingham), Okanogan National Forest (Okanogan), Olympic National Forest (Olympia), Snoqualmie National Forest (Seattle), and Wenatchee National Forest (Wenatchee).

Among the numerous State parks are Beacon Rock State Park, near Bonneville Dam, which is named for a lava rock second in size only to the Rock of Gibraltar; Deception Pass State Park, on Whidbey Island; Gingko Petrified Forest State Park, near Ellensburg; Sacajawea State Park, near Pasco, named for the Indian woman who guided Meriwether Lewis and William Clark (qq.v.) in their exploration of the Northwest; and Sun Lakes State Park, near Coulee City.

Sports. The seacoast, including the Puget Sound area, and the many lakes and streams in the Cascade Mts. provide good fishing in Washington. Salmon, with five species, is the most important fish, with migrating trout a close second. Other saltwater species are sole, flounder, sansole rockfish, and albacore. Freshwater species include some four varieties of trout, Rocky Mountain whitefish, black bass, crappie, bluegill, catfish, and perch. Game animals and birds hunted are white-tailed, coast, and mule deer, elk, black bear, mountain goat, bighorn sheep (residents only), snowshoe hare, cottontail rabbit, jackrabbit, four varieties of grouse, three varieties of quail, Hungarian and Chukar partridge, and wild

Clam-digging is family fun on the tidal beaches of the Pacific Ocean in Washington State.



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turkey. Washington has more than a dozen ski areas, including Stevens Pass; Hyak, Ski Acres, Alpentel, and Snoqualmie Summit, in Snoqualmie Pass; Crystal Mt.; Mt. Baker; Chewelah Peak; Mt. Spokane; and White Pass. Climbers, both novice and experienced, can find challenging mountains in Washington. Pinnacle Peak (6562 ft.), in the Tatoosh Range, is relatively easy. In Mt. Rainier National Park a snow and ice climbing school is conducted, the climax of which is a guided climb to the summit at Columbia Crest.

THE PEOPLE

According to the 1970 decennial census, the population of Washington was 3,409,169, an increase of 19.5 percent over the 1960 population. The urban segment comprised 2,476,468 persons, 72.6 percent of the total, compared with 68.1 percent in 1960. The rural segment comprised 932,701 persons, 27.4 percent of the total, compared with 31.9 percent in 1960. Ethnically, the 1970 population was distributed as follows:

A steelhead trout, landed in the Soleduck River on the Olympic peninsula near Port Angeles.

Washington State Dept. of Commerce



white persons, 3,251,055; nonwhites, 158,114, including 71,308 Negroes, 33,386 Indians, 20,335 Japanese, 11,462 Filipinos, 9201 Chinese, and others. The percentage of native-born residents was 95.4; of foreign-born, 4.6. The major countries of origin of the foreign-born, in order of rank, were Canada, Great Britain, and Germany. The 1970 population density averaged 51.2 per sq.mi., compared with 42.8 in 1960.

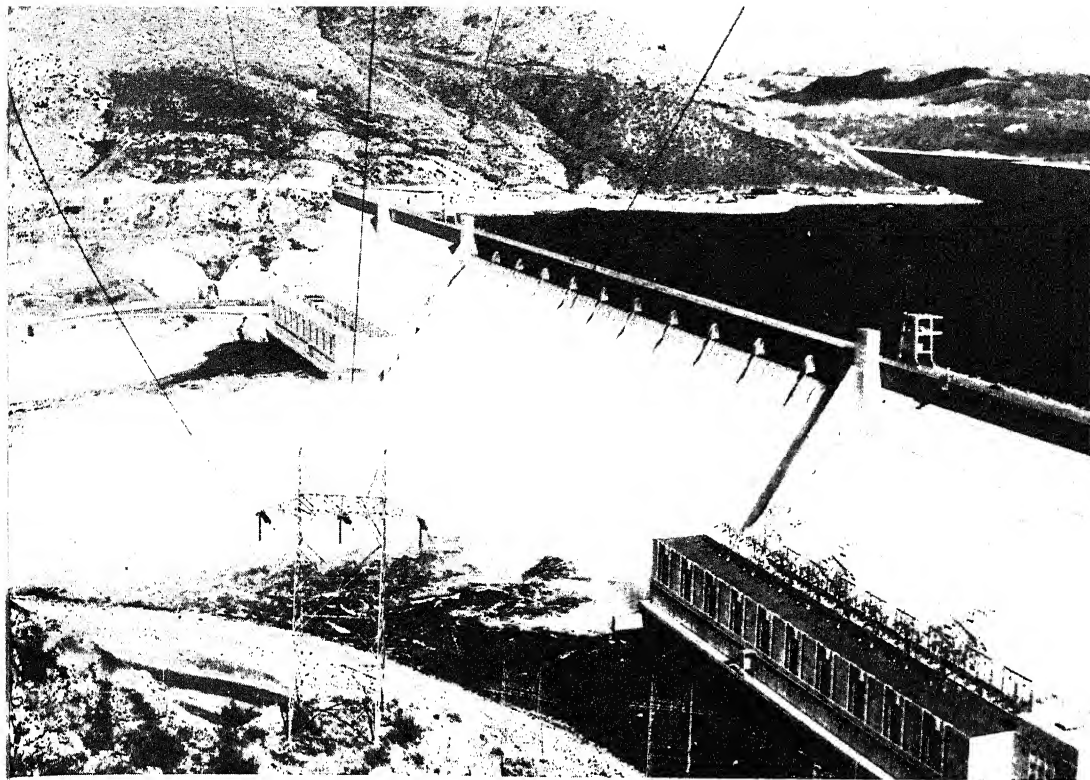
The chief cities are Olympia, the capital, a port on Puget Sound, a center of manufacturing and of the oyster industry and the site of Evergreen State College; and, in order of population, Seattle, a port on Puget Sound and a major industrial, financial, and commercial center, the site of the University of Washington; Spokane, an industrial and trading center for a wheat-producing, lumbering, and mining region; and Tacoma, a port on Puget Sound and an industrial and shipbuilding center.

The Indian population of Washington includes some twenty tribes on twenty-three reservations. Among the most numerous tribes are the Colville and the Yakima. Others include the Lummi, Spokane, Makah, Quinault, Nisqually, Puyallup, Skokomish, Snohomish, Swinomish, and Muckleshoot. See *AMERICAN INDIANS: Indians of the United States and Canada: North Pacific Coast Area*.

Education. The public-school system of Washington was established in 1854. Education in the State is compulsory for all children between the ages of seven and sixteen.

ELEMENTARY AND SECONDARY SCHOOLS. In the early 1970's public elementary schools numbered about 1145 and public secondary schools, about 500. Enrollment was about 557,000 in elementary and about 248,000 in secondary schools. Teachers in the public-school system numbered about 17,250 in elementary and about 16,200 in secondary schools. In the early 1970's private institutions included about 225 elementary schools with some 38,000 students, and about 80 secondary schools with some 14,000 students. Teachers in private schools numbered about 2475 in the late 1960's.

UNIVERSITIES AND COLLEGES. In the early 1970's Washington had thirty-nine institutions of higher learning, twelve of which were private. University and college enrollment was about 180,000. Public institutions include the University of Washington (q.v.), Washington State University, Central Washington State College, Eastern Washington State College, Western Washington State College, and Evergreen State College. Private institutions include Gonzaga University, Fort Wright College, Pacific Lutheran



Grand Coulee Dam on the Columbia River, and the Franklin D. Roosevelt Lake created by the vast concrete structure.

Bureau of Reclamation

University, Seattle University, Seattle Pacific College, the University of Puget Sound, Walla Walla College, Whitworth College, Whitman College, and Saint Martin's College. In addition, Washington has a system of twenty-six State-supported community and junior colleges.

Libraries and Museums. The Seattle Public Library, with more than 1,496,000 volumes, includes a special collection on aeronautics. The Washington State Library, in Olympia, has over 770,000 volumes and the University of Washington Library about 1,930,000 volumes. Cultural institutions include the Maryhill Museum of Fine Arts, with collections including items of European royal jewels; the State Capitol Museum, in Olympia; the Seattle Art Museum; the Eastern Washington State Historical Society, in Spokane; and the Washington State Historical Society and the Tacoma Art Museum, both in Tacoma.

THE ECONOMY

Washington has a diversified economy. Per capita personal income was \$6772 in 1976, compared with \$6441 for the U.S. as a whole. Agriculture employs about 7 percent of Washington's workers. Nonagricultural workers are employed, in descending order of numbers, by wholesale and retail trade; government; manufacturing; service industries; transportation and public utilities; finance, real estate, and insurance; and construction. The State's waterpower supports aluminum

smelting plants, and its West Coast location has made it a leading State in foreign trade. Tourism is a major contributor to the economy; tourists spend about \$1 billion annually in Washington. Fishing, hunting, climbing, and other outdoor recreation are especially popular.

Manufacturing. According to a recent survey of manufactures, production workers in Washington total 163,200. The largest numbers are employed in the lumber industry and in the manufacture of transportation equipment, processed foods, and paper products. About 43 percent are employed in the Standard Metropolitan Statistical Area (q.v.) of Seattle-Everett; and 45 percent of these work in the city of Seattle. Other manufacturing centers are Tacoma and Spokane. In the mid-1970's the value added by manufacture (see VALUE) in the largest industries totaled some \$2.30 billion for transportation equipment (particularly aircraft), \$1 billion for lumber and wood products, \$831,300,000 for food and kindred products, and \$623,800,000 for paper and allied products. The primary metal industry, especially aluminum smelting, contributed \$706,600,000 in value added. The value added by all manufacturing was about \$7.28 billion.

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Agriculture. Washington has diversified agriculture. Its principal commodities, in terms of cash receipts, are wheat, dairy products, cattle, and potatoes. Other important crops are hay and apples. Some 89,000 persons work on about 40,000 farms covering 16,500,000 acres; the average size of a farm is 415 acres. In the mid-1970's Washington led the U.S. in production of apples and sweet cherries and was the second-ranking producer of pears. Total annual cash receipts from agriculture during that period were about \$1.76 billion. Of this total, about \$1.2 billion was from crops and about \$523,000,000 was from livestock.

Fisheries. Washington is one of the Pacific Coast States; its fisheries provide salmon, tuna, oysters, crabs, shrimp, sea herring, flounder, and cod. The catch varies considerably. In the mid-1970's it totaled some 146,750,000 lb. and was valued at about \$58,300,000. Some 11,440 persons were employed as commercial fishermen in the State. The most valuable processed fishery products were canned salmon, canned animal food, industrial products, shucked oysters, and canned oysters. The total value of such processed products in the mid-1970's was about \$77,900,000.

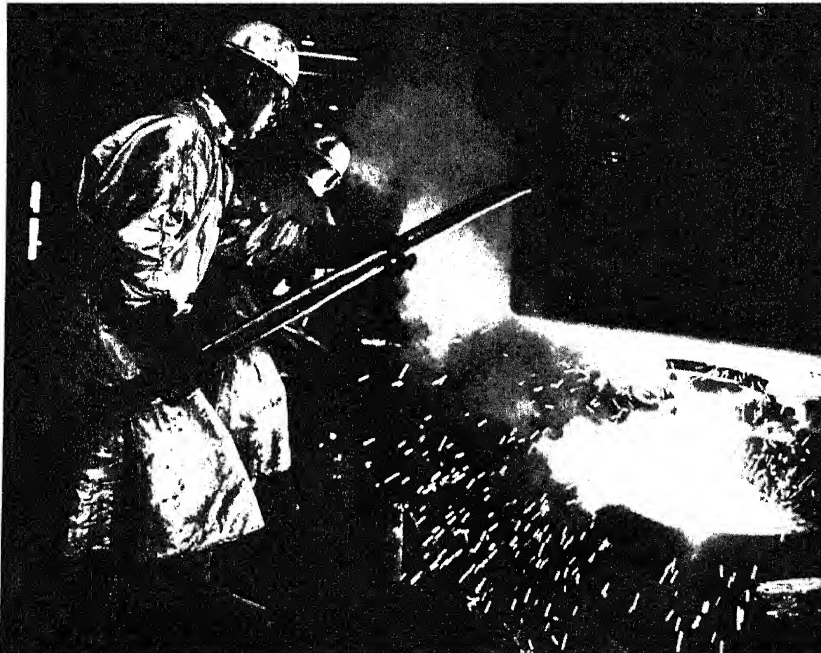
Mining. Washington's principal mineral products (in order of value) are cement, coal, sand and gravel, and stone. The total value of annual mineral production during the mid-1970's was about \$153,000,000, giving the State a rank of thirty-fifth in the U.S.

Energy. Generating plants in Washington, with a capacity of 18,500,000 kw, produced

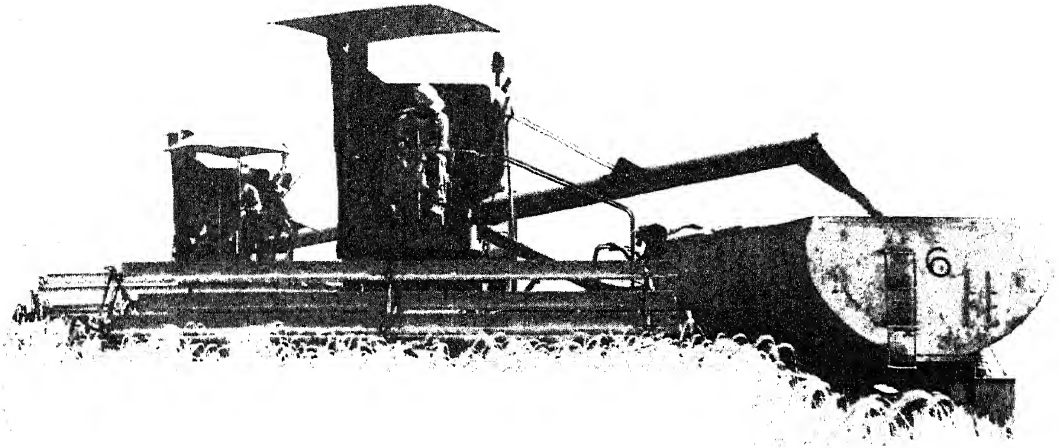
about 103.3 billion kw hours of electrical energy annually in the mid-1970's. About 90 percent of the production and more than 86 percent of the capacity were publicly owned. Major hydroelectric plants (such as those at Bonneville and Grand Coulee dams) abound in Washington, and the State contributes heavily to the Pacific Northwest power grid, sharing output with Oregon and other States.

Forestry. Washington is one of the leading lumber-producing States. Its commercial forest land is predominantly softwoods and amounts to approximately 18,400,000 acres. Ownership is divided almost equally between public and private. The forestry industry produces a net annual cut of sawtimber of some 6,450,000,000 bd.ft.

Transportation. The first railroad in Washington was the Cascades Railroad, inaugurated on April 20, 1863, and later abandoned. At present Washington is served by several major railroads, with a total of about 4723 mi. of track. Rural and municipal roads total some 84,300 mi.; Federally assisted primary and secondary highways total about 18,036 mi., including 762 mi. in the Interstate Highway System. The State is served by 9 international airlines and 10 local or interstate lines. There are some 112 public and 195 private airports. The major seaports are Seattle, Tacoma, Longview, Anacortes, Everett, and Vancouver. Among West Coast ports, Seattle is second only to Los Angeles in value of foreign trade. Washington's navigable waterways are the Columbia R. and its tributary the Snake R., and Puget Sound with its many branches.



Foundry workers prepare steel for use in the State's large shipbuilding industry.



A combine operates in a field of ripe grain in southern Washington. Wheat is one of the leading agricultural products of the State. Washington State Dept. of Commerce

Communications. The first newspaper in Washington was the *Columbian*, founded in Olympia in 1852. Today the State has 23 daily newspapers with a total circulation of 1,048,000 and 13 Sunday papers with a circulation of 1,027,000. Among the leading papers are the *Seattle Times* and *Post-Intelligencer*, the *Spokane Spokesman-Review* and *Chronicle*, and the *Tacoma News-Tribune*. Of some 165 radio stations, among the oldest was KTW (1920) in Seattle. There were 20 television stations.

GOVERNMENT

Washington is governed under the constitution of 1889, as amended. Executive authority is vested in a governor, a lieutenant-governor, an attorney general, and a secretary of state, all elected for four-year terms, and other elected and appointed officials. Legislative authority is exercised by the Senate, with forty-nine members elected for four-year terms; and the House of Representatives, with ninety-eight members elected for two-year terms. The legislature meets biennially in odd-numbered years and in special sessions at other specified times. The judicial system includes a supreme court, an appellate court, county superior courts, and other local and special courts. The State has thirty-nine counties.

Washington is represented in the United States Congress by two Senators and seven Representatives.

Voting Qualifications. Suffrage is extended generally to U.S. citizens eighteen years of age

who have been registered for thirty days prior to the election.

HISTORY

The first significant discovery in the region of present-day Washington was the mouth of the river later called Columbia. This river, which was discovered in 1775 by the Spanish explorer Bruno Heceta, was named in 1792 by Robert Gray (q.v.), a New England sea captain, who explored its estuary. Subsequent American claims to the region were partly based on Gray's visit. British navigators, including Captain James Cook, had meanwhile voyaged along the coast, and in 1792 George Vancouver (qq.v.) explored the coastal area of Puget Sound.

Early Exploration. The first exploration of the region, which had become known as the Oregon Country, was accomplished in 1805-06 by the Lewis and Clark Expedition (q.v.). Attracted by the potential fur trade in Oregon Country, the British also intensified their activities in the region. In 1810 the British explorer and fur trader David Thompson (1770-1857) founded a settlement at the confluence of the Little Spokane and Spokane rivers. The American merchant John Jacob Astor (see *under* ASTOR) sent a fur-trading expedition to Oregon Country in 1811. This expedition established a trading post, called Astoria, near the mouth of the Columbia R. and a fort at the mouth of the Okanogan R.

WASHINGTON

American occupation of the Oregon Country ended temporarily with the start of the War of 1812, leaving the ownership of the territory still in dispute. Negotiations in 1818 led to the establishment of the 49th parallel as the boundary between the United States and British possessions as far west as the Rocky Mts. Because a settlement could not be reached regarding the boundary west of the Rocky Mts. to the Pacific Ocean, and north of the 42nd parallel, the two countries agreed to a ten-year period of joint occupancy of the Oregon Country. In 1819 Spain, which also had laid claim to the area, relinquished its claims to all Pacific coast territory north of the 42nd parallel (the present northernmost extension of the California boundary); and in 1824 and 1825, by treaties with the U.S. and Great Britain, Russia relinquished its claim to the territory south of the parallel 54°40' (the present southernmost extension of the Alaska boundary). In 1827 the Anglo-American convention of joint occupancy of the Oregon Country was extended for an indefinite period.

The "Oregon Question". Although the British Hudson's Bay Company controlled the Northwest fur trade, organized American emigration began in the 1820's. The matter of the split jurisdiction of the region became a national problem, and the "Oregon question" came to occupy the attention of the United States Congress. By the late 1830's many Americans were demanding that Great Britain relinquish all jurisdiction south of 54°40' latitude; in 1844 the Democratic Party slogan, on which James K. Polk (q.v.) was elected President, was "Fifty-four forty or fight". In 1846 Great Britain and the U.S. signed the Oregon Treaty, a compromise measure that set the northern limits of U.S. territory at the 49th parallel, except for the southern tip of Vancouver Island, which was to remain British.

See NORTHWEST BOUNDARY DISPUTE.

Two years later the U.S. established the Territory of Oregon; it included the present States of Washington and Oregon, and portions of Idaho, Wyoming, and Montana. On March 2, 1853, Washington was constituted as a separate territory. It then included all of its present area in addition to portions of present-day Montana. In 1863 the Territory of Idaho was formed, and Washington assumed its present boundaries. Upon the organization of the Territory of Washington, the population was less than 4000. With the discovery of gold in eastern Washington, a great influx of settlers followed, alarming the Indians of the region, who feared for their hunting grounds. The Washington-Oregon Indian

War occurred in 1855-56. Again in 1857 serious Indian troubles arose concurrent with the rush of population to the gold fields of British Columbia. The greatest population influx to Washington occurred after the discovery of gold at the Salmon R. in 1860.

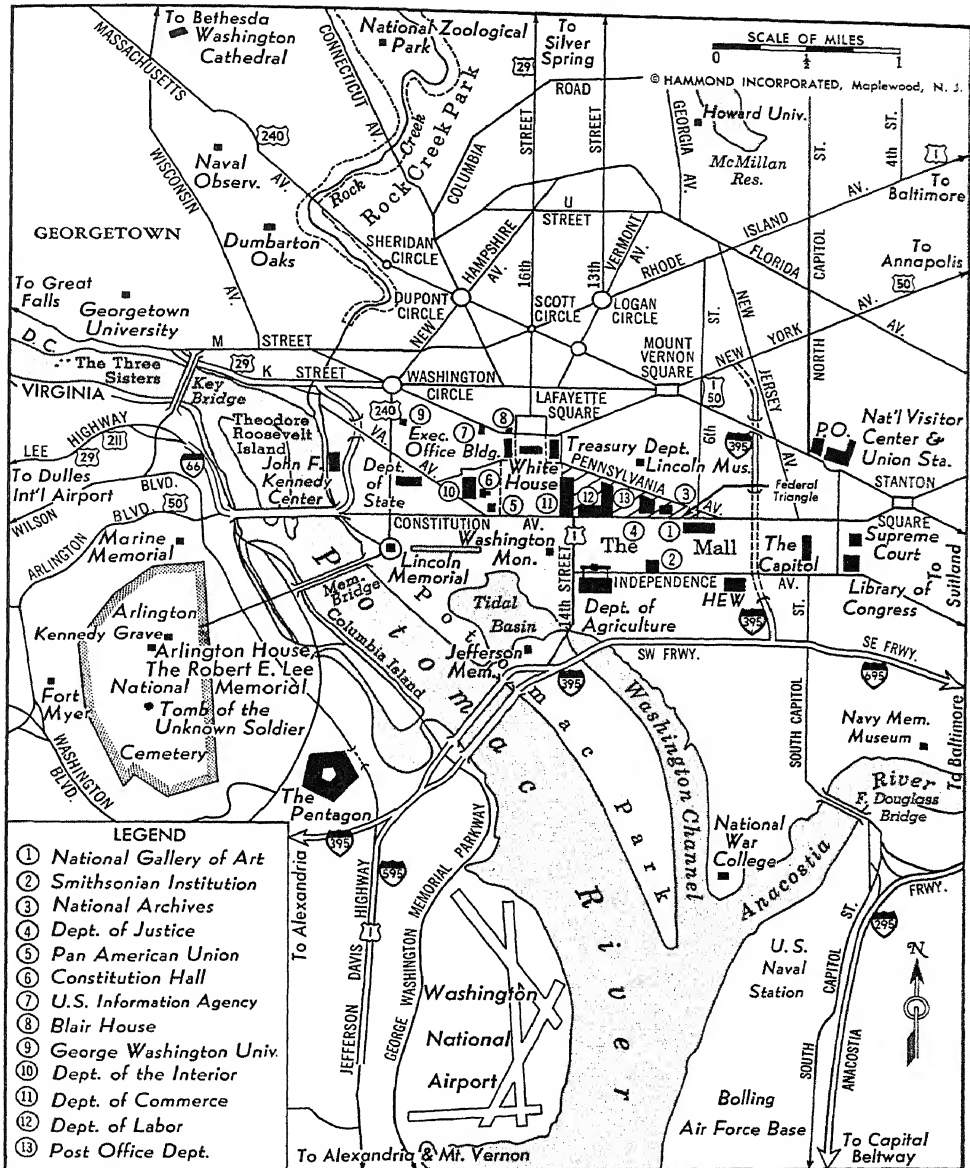
The Boundaries Are Set. The boundary treaty between Great Britain and the U.S. set the 49th parallel as the boundary from the Rockies to the channel between Vancouver Island and the mainland of the U.S. At that point the international boundary passed southwest through the channel to the sea. In 1859 a dispute arose as to which channel was meant; the settlement of this dispute would decide the possession of the Haro Archipelago. George Edward Pickett (q.v.), then a captain in the United States Army, occupied San Juan Island of the archipelago with his men and prevented the landing of British troops. An actual military engagement was averted by the arrival of a British admiral, who refused to resort to force. The question was finally settled in favor of the U.S. by the decision of an arbitrator, William I. (q.v.), Emperor of Germany, on Oct. 21, 1872.

In 1885 and 1886 the people of the territory entered into violent agitation against Chinese laborers who had been immigrating to the Pacific coast in increasing numbers. Mobs burned Chinese homes and in some cases resorted to murder. In order to end the outrages the territorial governor called for the aid of Federal troops and subjected Seattle to martial law. Washington was admitted into the Union as a State in 1889, when the United States Congress passed the Omnibus Statehood Bill admitting North and South Dakota, Montana, and Washington.

The discovery of gold in the Klondike (q.v.) in 1897 hastened Washington's commercial development. Through greatly expanded shipping and lumber industries, the economy advanced rapidly, and major Federal defense projects effected large economic and population increases. By the mid-20th century, agriculture had made dramatic gains. Construction of huge dams provided irrigation and flood control, as well as cheap electric power, and led to the development of inland ports and increased river shipping. As the gateway to Alaska, Washington is moving away from dependence on Federal contracts and is encouraging new industries to develop and process Alaskan resources.

WASHINGTON, capital of the United States of America, on the E. bank and at the head of navigation of the Potomac R., about 30 miles s.w. of the center of Baltimore, Md., and about 226 miles s.w. of New York City. Washington is

WASHINGTON (CAPITAL OF THE U.S.)



coextensive with the District of Columbia, the Federal District of the U.S. For information on various aspects of the city, including site, transportation facilities, industries, public-school system, government, and population, see DISTRICT OF COLUMBIA.

Plan of the City. By virtue of its picturesque site, systematic plan, lovely parks, and magnificent public buildings and memorials, Washington ranks among the most beautiful cities in the world. The plan of the original city was drafted in 1791 by Pierre Charles L'Enfant (q.v.), a French engineer and veteran of the American Revolution. L'Enfant worked under the close supervi-

sion of President George Washington (q.v.), who had selected the site of the Federal District.

The outstanding feature of L'Enfant's plan, the first ever prepared for a national capital, was the street layout, essentially a modification of the gridiron, or rectangular-block, pattern. The site of the Capitol of the United States (q.v.), the legislative nucleus of the new nation, fixed in the approximate center of the original city, was made the focal point of the street system. North Capitol Street and South Capitol Street became the north-south axis of the city; East Capitol Street and The Mall, a broad park extending westward to the Potomac, became the east-west

WASHINGTON (CAPITAL OF THE U.S.)

axis. Streets extending parallel to these axes completed the basic design, upon which was superimposed a system of diagonal avenues. The diagonal avenues, now numbering twenty-one and named for States of the Union, radiate from several central sites, particularly those of the Capitol and the Executive Mansion popularly called the White House (q.v.), traditionally the Presidential residence. Streets to the north and south of the east-west axis were designated by consecutive letters of the alphabet, beginning with A; streets to the east and west of the north-south axis were designated by sequential numbers, beginning with 1. To facilitate identification, the quadrantal districts into which the city was divided by the two axes were designated Northeast, Southeast, Southwest, and Northwest.

Besides the regularity of layout, the principal features of the capital street system are the unusual breadth of the thoroughfares and the profusion of bordering shade trees. Pennsylvania Avenue, the main thoroughfare of the city, is 160 ft. wide. The section of the avenue extending from the Capitol to the White House is the traditional route of Presidential inaugural parades. Massachusetts Avenue, $4\frac{1}{2}$ mi. long, is lined with double rows of shade trees. More than 600 mi. of Washington streets are fringed with trees, including such varieties as red oak, Oriental plane, maple, elm, and ginkgo. Five bridges span the Potomac at Washington, linking the city with Arlington (q.v.) and other Virginia communities.

The dismissal of L'Enfant in 1792, the subsequent loss of his designs, and other factors resulted in frequent violations of his plan for the development of the city, especially with respect to projected building sites, parks, and squares. Although the street layout was extended to the unoccupied portions of the Federal District, Washington developed in a generally haphazard fashion up to 1871. In that year an extensive program for the improvement of the city was initiated. Pavements were laid, a sewage system was installed, trees were set out, and a new water-supply system was provided. Congressional action later led to beautification of The Mall, acquisition of new park areas, and adoption of zoning regulations.

In 1926 responsibility for city planning was vested in a central governmental agency, the National Capital Park and Planning Commission. Among other actions, this commission added to the park system, developed plans for the guidance of Federal building construction projects, secured important changes in street layouts, and

otherwise provided for the systematic improvement of Washington. These responsibilities are now handled by the National Capital Planning Commission, which replaced the former agency in 1952. The commission is also responsible for the conservation of important natural and historical features in the city.

Parks and Monuments. The beauty of the city of Washington is enormously enhanced by the comprehensive park system, covering more than 6000 acres, the spacious grounds surrounding many of the public buildings, and several large recreation areas. Among the units of the park system, the most impressive is The Mall, with the Capitol and the Lincoln Memorial (q.v.) respectively dominating its eastern and western sides. On the axis between these two structures and south of the White House stands the Washington Monument (q.v.), the highest masonry structure in the world. Other features of The Mall are the Reflecting Pool between the Washington Monument and the Lincoln Memorial, the approach to Arlington Memorial Bridge, the United States Botanic Garden, the neighboring museums, The Mall and Adams drives, and Union Square, containing the Ulysses S. Grant Memorial Statue.

Rock Creek Park, in the Northwest, is the largest unit of the city park system. Comprising more than 1800 acres of woodland, the park contains about 30 mi. of bridle paths and is the site of Fort De Russey, an important outpost of the defense system designed to protect the Federal capital during the Civil War.

The second-largest park in Washington, Anacostia Park, comprises about 1100 acres along both banks of the Anacostia R., a tributary of the Potomac. The park, situated in the Southeast and Northeast, is the site of Kenilworth Aquatic Gardens, with a bird sanctuary and interesting collections of water plants.

In the Southwest is East Potomac Park, which is enclosed by Washington Channel, by the Potomac R., and by the Tidal Basin, an artificial lake. The north shore of the Tidal Basin adjoins The Mall. A scenic parkway, Ohio Drive, along the perimeter of the Tidal Basin and East Potomac Park is connected with Rock Creek and Potomac Parkway, leading to the National Zoological Park (175 acres) and beyond to Rock Creek Park. The Thomas Jefferson Memorial, an impressive structure modeled after the ancient Pantheon in Rome, stands in East Potomac Park. Both this park and the adjacent West Potomac Park contain a profusion of plants, shrubs, and trees, including about 3000 Japanese cherry trees, a gift in 1912 from the people of Tokyo,



The Thomas Jefferson Memorial, a National Monument, in East Potomac Park.

Abbie Rowe - National Park Service

Japan. The annual spectacle of the cherry trees in bloom, usually beginning about the first week of April, is a notable tourist attraction.

Other well-known units of the capital park system are Fort Stanton Park, Theodore Roosevelt Memorial Island Park, Glover-Archbold Parkway, Brentwood Park, Lincoln Park, Meridian Hill Park, and Montrose Park. Washington also has a large number of smaller parks and squares, mainly comprising areas at the intersection of streets and avenues. The chief recreational facility in the city is the Robert F. Kennedy Memorial Stadium (seating capacity about 50,000), the home grounds of the Washington Senators baseball team of the American League from 1901 to 1971, and the Washington Redskins of the National Football Conference.

Public Buildings. Architecturally, the most conspicuous structure in Washington, D.C., is the Capitol of the United States. The White House, notable for its simple dignity, is the city's oldest public building. Other outstanding public buildings are grouped chiefly in the vicinity of the Capitol, The Mall, and the White House. Flanking the Capitol to the northeast and the south, respectively, are the new Senate Office Building and the Cannon, Longworth, and Rayburn House of Representatives office buildings, all connected to the Capitol by tunnel walkways or subways. The Supreme Court Building, seat of the highest judicial tribunal of the U.S. government, occupies a site opposite the Capitol to the east; designed by the American architect

Cass Gilbert (q.v.) and completed in 1935, the structure has a huge portico containing sixteen Corinthian columns and a sculptured pediment. The main building of the Library of Congress (q.v.), adjoining the Supreme Court Building on the south and completed in 1897, is of gray granite, in Italian Renaissance style; a modern annex of white marble adjoins the library.

The triangle formed by the intersection of Pennsylvania and Constitution avenues and Fifteenth Street is the site of the largest grouping of modern public buildings in the capital. At the base of the triangle and a short distance southeast of the White House is the Department of Commerce Office Building, completed in 1932. Covering an area of 8 acres, the structure is an adaptation of the Italian Renaissance style. Harmoniously designed but somewhat smaller, the other structures in the so-called Government Triangle include those of the Post Office Department (1934), the Department of Justice (1934), the Department of Labor (1935), the National Archives (1935), and the Federal Trade Commission.

Except for the Department of Agriculture Building, a white marble structure a short distance southeast from the Washington Monument, all of the buildings along the north and south sides of The Mall house museums and art galleries. Especially interesting from an architectural standpoint are the Museum of History and

WASHINGTON (CAPITAL OF THE U.S.)

Technology, built of white marble in the neo-classic style; the original buildings of the Smithsonian Institution (q.v.), in the turreted Norman style; and the National Gallery of Art, completed in 1941 and one of the most magnificent buildings in the city.

Of the public structures in the immediate vicinity of the White House, the Treasury Department Building is the most imposing. The building is made of granite, in Greek Ionic style; its main section was completed in 1842. On the opposite (west) side of the White House is the Executive Office Building, which formerly housed the departments of state, war, and the navy. A massive edifice in French Renaissance style, it was completed in 1888.

Scores of other imposing public buildings, as well as numerous semipublic and privately owned buildings, are situated in Washington. Among them are the Federal Reserve Building (1937); the Corcoran Gallery of Art (q.v.); the Washington Public Library; the National Academy of Sciences; the Folger Shakespeare Library; the Department of Interior Building; the Pan American Building; Memorial Continental Hall, headquarters of the Daughters of the American Revolution; the Social Security Building; Union Station; and a large number of luxurious hotels, private mansions, and foreign embassies. Other outstanding points of interest are the U.S. Naval Observatory, the United States Soldiers Home, the United States Navy Yard and Museum, the Army Medical School, Walter Reed General Hospital, the Army War College, the Army Medical Center, and the Scottish Rite Temple.

Washington is the site of several well-known places of worship. The Cathedral of Saints Peter and Paul, known also as Washington Cathedral, is the seat of the Protestant Episcopal diocese of Washington. Other churches include the National Shrine of the Immaculate Conception, the Franciscan Monastery, the Church of the Pilgrims (Presbyterian), the National Baptist Memorial Church, the Swedenborgian Church of the Holy City, and the Metropolitan Methodist Church. Saint John's Church (Episcopal) is frequently called the President's Church, because its parishioners have included many U.S. Presidents.

The Pentagon, housing the United States Department of Defense, is situated opposite the city, in Virginia. One of the largest office buildings in the world, it contains more than 3,600,000 sq.ft. of floor space.

Educational and Cultural Facilities. Few cities in the world are better equipped with educational and cultural facilities than Wash-

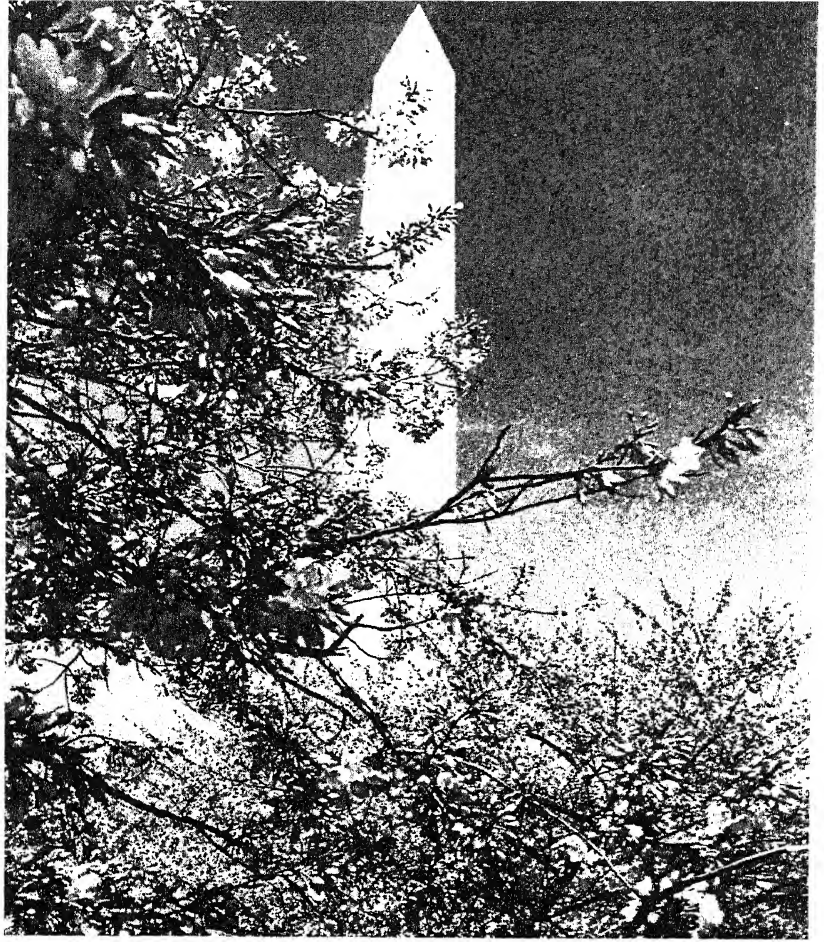
ington. Prominent institutions of higher learning are Georgetown University, George Washington University, American University, Howard University, and the Catholic University of America (qq.v.). Many other schools in the city provide advanced, specialized, and professional courses of study. Sectarian colleges include Saint John's College (Roman Catholic), Trinity College (Roman Catholic), Washington Missionary School (Seventh-Day Adventist), and the College of Church Musicians. Other schools of higher learning in the city include the Washington College of Law, Washington Bible College, United States College of Veterinary Surgeons, Federal City College, Miner Teachers College, James Ormond Wilson Teachers College, and Army Medical College. Outstanding schools of art are the Yard School of Fine Arts, Washington School of Art, National School of Fine and Applied Art, and the Corcoran School of Art. Gallaudet College, the first school of higher learning for deaf-mutes in the U.S., is in Washington. The Carnegie Institution of Washington and the Brookings Institution (qq.v.) afford facilities for advanced research in various fields.

The libraries, museums, and art galleries of Washington contain unsurpassed collections, and with few exceptions are available to the public without charge. Notable libraries include the Library of Congress (q.v.), the largest in the U.S., with more than 72,000,000 items; the Washington Public Library, with more than 1,400,000 volumes; the Folger Shakespeare Library, with a variety of priceless collections, including many original and early editions of Shakespeare's works; the Dumbarton Oaks Research Library and Collection, with about 60,000 volumes; the libraries of the Walter Reed Army Medical Center, which together have one of the largest collections of the kind in the world; the Library of the Daughters of the American Revolution; and libraries maintained by various departments of the Federal government, by museums, and by schools of higher education. Important museums include the Smithsonian Institution, the various branches of which embrace practically the entire realm of human culture; the Corcoran Gallery of Art; the Phillips Memorial Gallery; the Folger Shakespeare Library; and the Dumbarton Oaks Collection.

Various well-known learned societies maintain headquarters in Washington, among them the National Geographic Society, National Academy of Sciences, American Association for the Advancement of Science, American Historical Association, Washington Academy of Sciences, Philosophical Society of Washington, American

The Washington Monument, a National Memorial, seen through the delicate tracery of magnolia and cherry blossoms.

UPI



Institute of Architects, Entomological Society of America, and the American Civic Association.

History. Information concerning the acquisition and evolution of the site of Washington is given in the article on the District of Columbia; see also *CAPITALS OF THE UNITED STATES*. The projected city was officially named in September, 1791. Within the next two years construction began on the Executive Mansion and the Capitol. President John Adams (q.v.) was the first resident of the White House in 1799. In November, 1800, one wing of the Capitol having been completed, the Congress of the United States held its first session in Washington. During the final years of the 18th century, however, growth of the city had proceeded very slowly, and contemporary humorists referred to the capital variously as the City of Magnificent Distances, the City of Streets Without Houses, the Wilderness City, and the Capital of Miserable Huts.

Much of the expansion achieved in the first decade of the 19th century was negated by the British attack on the city in 1814, which caused the total or partial destruction of all but two of

the public buildings in Washington; see *WAR OF 1812*. At the close of the war the buildings were rapidly repaired or replaced.

Because of its strategic location, the city figured significantly in the American Civil War; see *CIVIL WAR*, *THE AMERICAN*. A major supply depot and hospital center for the Union armies, it was repeatedly threatened by Confederate forces. Troops under General Jubal Anderson Early (q.v.) were halted only a few miles from the city limits in July, 1865.

In 1887 Pierre L'Enfant's *Plan of the City of Washington* was rediscovered. Insofar as accomplished violations permitted, subsequent planning for the improvement of the city was based on the original designs. Pop. (1960) 763,956; (1970) 756,510.

WASHINGTON, city in Pennsylvania, and county seat of Washington Co., on Chartiers Creek, 32 miles s.w. of Pittsburgh. It is served by railroad, and lies in a fertile agricultural area also noted for the production of bituminous coal, oil, and natural gas. The principal industries in the city are the production of a wide variety of

WASHINGTON, BOOKER T.

glassware, steel, and electronics equipment Washington is the site of Washington and Jefferson College, established in 1780, on the campus of which is a memorial library founded by a gift from Benjamin Franklin (q.v.), the American scientist and diplomat. Historic sites in the city include the house, built in 1788, which served as headquarters for David Bradford, leader of the Whiskey Rebellion (q.v.) in 1794

History. The town of Washington was founded in 1781 by David Hoge, who had bought land in the region in 1771; two lots in the town were presented by him to General George Washington (q.v.). In 1876 the first crematory in the United States was established here by Francis Julius Le Moyne (1798–1879), an abolitionist noted for his efforts on behalf of runaway slaves from the South. The town was incorporated as a borough in 1810 and chartered as a city in 1924. Pop. (1960) 23,545, (1970) 19,827.

WASHINGTON, Booker Taliaferro (1856–1915), American educator, born on a plantation in Franklin County, Va., the son of a slave. Fol-



Booker T. Washington

American Museum of Photography

lowing the American Civil War, Washington and his family moved to Malden, W. Va., where he worked in a salt furnace and in coal mines, attending school whenever he could. From 1872 to 1875 he attended a newly founded school for Negroes, the Hampton Normal and Agricultural Institute, now Hampton Institute (q.v.), at which he paid for his room and board by acting as janitor. After graduation he taught for two years in

Malden and then studied at Wayland Seminary, Washington, D.C. In 1879 he was appointed instructor at Hampton Institute, where he helped to organize a night school and was in charge of the industrial training of seventy-five American Indians. The school was so successful that in 1881 the founder and head of the Hampton Institute, the American educator Samuel Chapman Armstrong (q.v.), appointed Washington organizer and principal of a Negro normal school in Tuskegee, Ala., now Tuskegee Institute (q.v.). Washington advanced the institution into a major center for industrial and agricultural training and in the process became a well-known public speaker. On Sept. 18, 1895, he made his famous Atlanta compromise speech, in which he urged Negroes to accept their inferior social position for the present and strive to raise themselves through vocational training and economic self-reliance. Many whites, pleased by his views, and many Negroes, awed by his prestige, accepted Washington as the chief spokesman of the American Negro. More militant Negroes, such as the American sociologist and educator W.E.B. Du Bois (q.v.), refused to settle for such quiescent tactics, however, and strongly opposed him; see WASHINGTON-DU BOIS CONTROVERSY.

In addition to public speaking, Washington founded organizations such as the National Negro Business League to further Negro advancement and wrote several books. His books include *The Future of the American Negro* (1899), the autobiography *Up from Slavery* (1901), *Life of Frederick Douglass* (1907), *The Story of the Negro* (1909), and *My Larger Education* (1911). The site of the plantation where Washington was born is a national monument, administered by the National Park Service (q.v.). See *NEGROES IN THE UNITED STATES: History: New Leaders*.

WASHINGTON, George (1732–99), American general and first President of the United States, eldest son of the Virginia planter Augustine Washington (d. 1743) and his second wife, Mary Ball (1708–89). Born on his father's estate in Westmoreland County, Va., on Feb. 22, 1732, he later moved to Mount Vernon (q.v.), the home of his elder half-brother, Lawrence Washington (d. 1752), who was allied with the powerful Fairfax (q.v.) family of Virginia. Before Lawrence died, he bequeathed the Mount Vernon property in such a way that it eventually came into the possession of George.

Although George Washington had little or no formal schooling, his early notebooks indicate that he read widely in geography, military his-

tory, agriculture, deportment, and composition, and showed some aptitude in surveying and simple mathematics. In later life he developed a style of speech and writing which, though not always polished, was marked by clarity and force. Tall, strongly built, and fond of action, he was a superb horseman and enjoyed the robust sports and social occasions of the planter society in which he moved. At the age of seventeen he was invited to join a party to survey lands owned by the Fairfax family west of the Blue Ridge Mts. His journey led him to take a lifelong interest in the development of western lands. In the summer of 1749 he was appointed official surveyor for Culpeper County, and during the next two years he made many surveys for landowners on the Virginia frontier. In 1753 he was appointed adjutant of one of the districts into which Virginia was divided, with the rank of major.

Early Military Experience. Washington played an important role in the struggles preceding the outbreak of the French and Indian War (q.v.). He was chosen by Lieutenant Governor Robert Dinwiddie (q.v.) of Virginia to deliver an ultimatum calling on French forces to cease their encroachment in the Ohio R. valley. The young messenger was also instructed to observe the strength of French forces, the location of their forts, and the routes by which they might be reinforced from Canada. After successfully completing this mission, Washington, then a lieutenant colonel, was ordered to lead a militia force for the protection of workmen who were building a fort at the Forks of the Ohio R. Having learned that the French had ousted the work party and renamed the site Fort Duquesne, he entrenched his forces at a camp named Fort Necessity and awaited reinforcements. A successful French assault obliged him to accept articles of surrender, and he was permitted to depart with the remnants of his company.

Washington resigned his commission in 1754, but in May of the next year he began service as an unpaid volunteer aide-de-camp to the British General Edward Braddock (q.v.), who had been sent to Virginia with a force of British regulars. A few miles from Fort Duquesne Braddock's men were ambushed by a band of French and Indians. Braddock was mortally wounded and Washington, who behaved gallantly during the conflict, narrowly escaped death. In August, 1755, he was appointed to command the Virginia militia with the rank of colonel, charged with the defense of the long western frontier of the colony. War between France and Britain was officially declared in May, 1756, and while the

principal struggle moved to other areas Washington succeeded in keeping the Virginia frontier relatively safe.

Virginia Planter and Political Leader. Disappointed in his efforts to obtain a suitable commission in the regular British army, Washington decided to return to civilian life. His estates needed his attention, he had been elected to the Virginia House of Burgesses, and he was engaged to be married. On Jan. 6, 1759, he married Martha Dandridge Custis (see WASHINGTON, MARTHA), a well-to-do widow with two children by her first marriage. He became an active and prosperous country squire, developing his farms, shrewdly speculating in western lands, caring for his many relatives, and attending sessions of the burgesses.

Like other Virginia planters, Washington became alarmed by the repressive measures of the British crown and Parliament in the 1760's and early 1770's. The acts convinced Washington and his fellow burgesses that the colonies must unite in defense of their liberties. See AMERICAN REVOLUTION. He was fully in sympathy with the vigorous resolutions adopted by the burgesses, and in July, 1774, he presided at the meeting that adopted the Fairfax Resolves, a defiant expression of dissent. Elected as one of seven Virginia delegates, he attended the first Continental Congress in Philadelphia on Sept. 5, 1774.

The fighting at Lexington and Concord on April 19, 1775, made a second Continental Congress mandatory if the colonies were to be defended. Washington, recognized as a leader in the opposition to British coercion, again represented Virginia and served efficiently on various committees on military affairs. On June 15, 1775, the Congress resolved that "a General be appointed to command all the continental forces raised for the defence of American liberty", and Washington was unanimously elected to the post.

The American Revolution. By the time he took command of his army at Cambridge, Mass., on July 3 the war had begun. The New England militia had defeated the British regulars at Bunker Hill; Fort Ticonderoga on Lake Champlain had fallen to the American commanders Ethan Allen and Benedict Arnold (qq.v.); and colonial troops had failed to take Québec. Washington was faced with the task of transforming his militiamen into a disciplined force capable of undertaking further operations. Plagued throughout the war by problems of logistics, training, staff organization, and the arbitrary decisions of Congress, he met them with unflinching courage and fortitude.



George Washington (portrait by the contemporary American artist Charles Willson Peale).

New York Historical Society

After forcing the British commander Sir William Howe (see under Howe) to evacuate Boston on March 17, 1776, Washington prepared to defend New York as ordered by Congress. The Battle of Long Island ended in defeat through his faulty strategy, and he was forced to draw back to New Jersey. During the winter of 1776–77 the morale of his shrunken army was alarmingly low and the revolutionary cause seemed hopeless. Spirits revived, however, when a daring amphibious operation across the Delaware R. on Christmas night, 1776, resulted in the capture of the garrison of German mercenaries at Trenton, N.J. Also successful was an attack on British positions at Princeton, N.J.

Washington spent the early part of 1777 at Morristown, N.J., drilling his troops for a fresh campaign as Howe prepared to shift his base from New York to Philadelphia. After defeating the colonials at Brandywine and Germantown in the autumn, Howe occupied the city. The capture of the American capital was disheartening, but the colonials took courage at the news of the American victory at Saratoga in October, 1777. This victory encouraged the French to enter into a military alliance with the colonies in February, 1778. In the spring of that year the Continental Army, by then a disciplined force, left winter quarters at Valley Forge, Pa. The British abandoned Philadelphia and returned to

New York, with Washington in pursuit. Near Monmouth Courthouse in Freehold, N.J., the British were attacked by the Continentals but managed to retreat to New York in June, 1778.

The war then shifted to the northwestern frontier and the South, while Washington contained the British in and around New York. In July, 1780, a French army arrived at Rhode Island, and a combined attack on New York was planned. When news came that the French West India fleet would undertake operations in the Chesapeake Bay area, a totally new strategy was adopted. The British army under General Charles Cornwallis (q.v.) at Yorktown, Va., would be cut off from retreat by the French fleet while a combined French-American army attacked him by land. Washington seized this opportunity and mounted a skillful assault on Yorktown. On Oct. 19, 1781, Cornwallis surrendered. Except for some minor skirmishing, the war was over. Peace negotiations began in Paris in 1782, and a final treaty was signed on Sept. 3, 1783. Washington then made a notable farewell to his officers, resigned his commission, and returned to Mount Vernon.

See separate articles on many of the battles mentioned.

Organizing a New Government. Washington's immense prestige, both at home and abroad, made him the logical choice to preside at the Federal Constitutional Convention in 1787; see CONSTITUTION OF THE UNITED STATES: *The Constitutional Convention*. An advocate of a strong central government, he had become convinced that the Articles of Confederation (q.v.) were too ineffective to bind the States and preserve public order. Washington had already shown great interest in closer cooperation between the States when, in 1785, delegates from Virginia and Maryland met in Alexandria, Va., to discuss regulations for the navigation of Chesapeake Bay and the Potomac R. Washington, who owned about 30,000 acres of western lands, hoped that improved navigation of the Potomac would give easier access to the West and invited the delegates to discuss the problem at Mount Vernon. This led to a convention at Annapolis in September, 1786, to study interstate commercial problems. Because only five States were represented, a report was prepared calling on all States to attend a new convention in Philadelphia to discuss all matters necessary for efficient government.

Throughout the exhausting debates in Philadelphia, Washington presided with decorum and fairness. He was not a political theorist, and his role was that of arbiter rather than innovator.



The birthplace of George Washington, now a national monument, at Bridges Creek, Westmoreland County, Virginia
U.S. Dept. of the Interior

He was fairly well pleased with the Constitution that emerged from the convention, and he assisted in the difficult struggle to secure ratification by the States. When this was achieved and a new Congress was chosen, the electoral college (q.v.) unanimously elected him President, with John Adams (q.v.) as Vice-President. Washington, uncertain of his ability to conduct government and realizing the difficulties that lay ahead, accepted the honor with reluctance and a sense of duty.

First President of the United States. For the first few months after his inauguration on April 30, 1789, Washington presided over a temporary government based on the old Articles of Confederation. His first task, therefore, was to guide the establishment of a federal system based on the new Constitution and to choose departmental heads to assist him. He feared the growth of political parties and purposely appointed men of divergent views as his chief executive officers. The President was deferential to the views of his chief secretaries, Alexander Hamilton and Thomas Jefferson (qq.v.), lodged considerable responsibility with them, and conferred with them frequently. His habit of holding frequent meetings of his advisers led to a kind of cabinet system, something not envisaged by the framers

of the Constitution. Before appointing a man to office, Washington inquired closely into his character and abilities.

By the 1790's two political parties began to emerge, taking form as the Federalist Party (q.v.) and the Anti-Federalists, later known as Democratic-Republicans or Republicans (see DEMOCRATIC PARTY). The former, led by Hamilton, generally favored a strong central government, a sound monetary system, legislation benefiting manufacturers and merchants, and closer relations with Great Britain. The other group, with Jefferson as chief spokesman, had little sympathy with commercial interests, feared the concentration of power in a central government, and supported the French. Washington was deeply distressed by the conflict between Hamilton and Jefferson, especially when the latter resigned from the cabinet in 1793. A mediator rather than a planner in regard to legislation, Washington nevertheless supported the Federalists and agreed with Hamilton's program for stabilizing the finances of the nation and for strengthening its credit abroad. The program called for funding the debts owed by the Con-

WASHINGTON, GEORGE

federation at face value, the assumption of State debts by the central government, and the chartering of a Bank of the United States similar to the Bank of England (see **BANKS AND BANKING: *The United States Banking System***). A mild version of his recommendations to aid manufactures was adopted in the Tariff Act of 1792.

Second Term. In 1792 Washington was persuaded to run for reelection. He had no opposition and again received the unanimous vote of the electoral college, with John Adams retaining the Vice-Presidency. In his second administration Washington was harassed not only by partisan intrigue at home but by the difficulty of maintaining neutrality in the war between Britain and France that followed the French Revolution (q.v.). Here again Republicans and Federalists clashed, the former sympathizing with the French struggle, the latter stressing the cultural and commercial ties with Great Britain that still existed despite the winning of independence. Washington, realizing that the U.S. needed a period of tranquility to develop its own institutions, issued a proclamation of neutrality and nonintervention in European affairs. For this he was harshly criticized in Republican newspapers. The clamor against him increased when he sent the Federalist statesman John Jay (q.v.) to London to negotiate a settlement of American grievances; see **JAY'S TREATY**. The enforcement of the excise presented another problem in Washington's second administration; see **WHISKEY REBELLION**. Washington's wise leadership during this period produced the Treaty of San Lorenzo with Spain (1795), providing for free navigation of the Mississippi R. He also encouraged the opening of western lands to settlement and presided over the development of the new Federal city, later Washington, D.C.

Last Years. Although he could have been re-elected for a third term, Washington chose to retire after so many years of public life. In his Farewell Address in 1796 (printed but never orally delivered in public) he emphasized again the dangers of party rivalry, advised that the national credit be maintained, and warned his country to renounce permanent alliances with foreign nations. He rendered his last public service in the undeclared naval war of 1798 when President Adams offered him the command of a volunteer army authorized by Congress for possible use against the French. He accepted with the condition that Hamilton be appointed his immediate subordinate in command, but peace was swiftly restored and the army saw no action.

Washington died after a brief illness on Dec.

14, 1799, and was buried in the family vault at Mount Vernon. The public mourning for Washington was almost as widespread in Europe as it was in the U.S. Homage was paid to him by the armies of Napoléon Bonaparte, afterward Napoleon I (q.v.), Emperor of France, and by the Channel fleet of Great Britain. On all sides it was acknowledged that the world had lost a statesman of the highest rank. The general estimate of Washington is admirably epitomized in the tribute of the American soldier and statesman Henry Lee (see *under* **LEE**) that he was "first in war, first in peace, and first in the hearts of his countrymen". Although he was, like almost all the propertied Americans of his time, a slaveholder, he was a humane and considerate master. He possessed at his death 124 slaves; in his will, he directed that they be emancipated at the death of his wife. As early as 1786 he expressed himself in favor of abolition by legislative authority. All of Washington's biographers have attested to his courage, indestructible spirit in adversity, sound judgment, and absolute integrity of motive. N.W.P.

WASHINGTON, Martha (1732–1802), wife of United States President George Washington (q.v.), born Martha Dandridge in New Kent County, Va. The daughter of a prosperous planter, she was married at seventeen to one of the wealthiest planters in Virginia, Daniel Parke Custis (d. 1757), by whom she had four children, two of whom died in infancy. After Custis' death, she met George Washington, whom she married on Jan. 6, 1759. They had no children but adopted the younger two of four children left by her son, who had died. During the American Revolution (q.v.) Martha Washington often shared the rigors of camp life with her husband and stayed with him during the long, hard winter at Valley Forge (q.v.). Later, when she was first lady, she entertained lavishly, first in New York, then in Philadelphia, and became known as a gracious hostess.

WASHINGTON AND LEE UNIVERSITY, non-sectarian privately controlled liberal arts institution, in Lexington, Va. Founded in 1749 as Augusta Academy, a private secondary school, and renamed Liberty Hall Academy in 1776, the institution was chartered as a college in 1782. In 1798 the college received a gift of \$50,000 from George Washington (q.v.), first President of the United States. It bore the name Washington College from 1813 to 1871, when the present name was adopted in honor of the Confederate commanding general Robert E. Lee (see *under* **LEE**), who had been president of the college from 1865 to 1870.

Divisions of the university are the college, which offers more than 600 courses, and the school of commerce, economics, and politics, both of which confer the bachelor's degree; and the school of law, which is coeducational and confers the first professional degree. The university also provides opportunities for foreign study; it is developing programs in Far Eastern studies, including language, culture, and art, and has exchange programs in Hong Kong, Japan, and Taiwan. The library system has about 325,000 volumes. In 1973 student enrollment was about 1600, the faculty numbered 150, and the endowment of the university was \$24,500,000.

WASHINGTON CONFERENCE, meeting of representatives of Belgium, China, France, Great Britain, Italy, Japan, the Netherlands, Portugal, and the United States, called by the U.S. and convening in Washington, D.C., from Nov. 12, 1921, to Feb. 6, 1922. The conference was held to limit naval armaments generally and to promote better relations among nations with conflicting interests in the Pacific Ocean and the Far East. As a result of the discussions the following treaties were adopted.

A treaty signed by the five major naval powers limited the total tonnage of capital ships, that is, ships with more than 10,000 tons displacement, to a ratio of 5-5-3-1.7-1.7 for the U.S., Great Britain, Japan, France, and Italy, in that order. It also stipulated that the status quo in respect to fortifications in the Pacific should be maintained. Another treaty between the same powers required submarines to abide by the same rules of warfare as surface ships and banned the use of poisonous gases in warfare.

The Four-Power Treaty between the U.S., the British Commonwealth, France, and Japan required the countries to respect each other's possessions in the Pacific.

The Nine-Power Treaty between all the participating nations guaranteed Chinese territorial integrity and the so-called open-door policy; see **OPEN DOOR**. Another treaty between the same nine powers guaranteed the Chinese greater control of their customs tariff, and a treaty between Japan and China pledged the Japanese to evacuate Shantung Province in China.

Although the Washington Conference treaties succeeded temporarily in stabilizing the Far Eastern situation, relations among the great powers began to deteriorate again in 1931, after the Japanese launched a war of aggression in China. In 1934 Japan announced that its Five-Power Treaty obligations would be terminated

in December, 1936, the earliest possible date under the terms of the treaty; see **JAPAN: History: The 20th Century: World War I**.

See also **DISARMAMENT**; **UNITED STATES OF AMERICA, THE: History: The Nation Between the Two World Wars**.

WASHINGTON-DU BOIS CONTROVERSY, difference of opinion arising early in the 20th century over the best means of ensuring progress for Negroes in the United States (q.v.). The dispute involved the conflicting views of the American educator Booker T. Washington and the American sociologist W.E.B. Du Bois (qq.v.). Washington, the founder and principal of Tuskegee Institute (q.v.) in Alabama, felt that black Americans, through education and specific forms of vocational training, should prepare themselves to take advantage of the opportunities offered by American society without openly attempting to alter substantially the prevailing social structure. Du Bois, a founder of the National Association for the Advancement of Colored People (q.v.) and editor of its journal *Crisis*, argued that discrimination practiced in the U.S. denied essential rights to American Negroes and prevented them from obtaining opportunities for advancement. Emphasizing the importance of a general liberal education rather than simple vocational training, Du Bois urged that Negroes actively seek full participation in the electoral process and in the economy; Washington advocated a more conciliatory approach. For many years Washington was accepted as the spokesman of the American Negro, particularly by white Americans. Since World War II, however, views similar to those of Du Bois have become more prevalent. B.Q.

WASHINGTON MONUMENT, national memorial at the western end of The Mall in Washington, D.C., erected by authority of Congress to honor and perpetuate the memory of George Washington (q.v.), first President of the United States. The original design for the monument by the American architect Robert Mills (q.v.) was later largely redone by other architects. Constructed in the form of a hollow shaft or obelisk (q.v.), the monument is 555 ft. 5½ in. high and weighs 81,120 tons. The outer walls are faced with white marble from Maryland and the apex is formed by a capstone of pure aluminum. Set into the inner walls are 150 inscribed stones contributed by the various States, and by individuals, organizations, and foreign countries. At the top, which may be reached by elevator or by an iron stairway of 898 steps, there is an observation room with two windows on each of the four sides.

WASHINGTON, MOUNT

In 1833 the Washington National Monument Society was formed to raise funds for a memorial to George Washington. Congress authorized the society to begin construction in 1848 and on July 4 of that year the cornerstone was laid with the same trowel used by President Washington in 1793 to lay the cornerstone of the Capitol; see **CAPITOL OF THE UNITED STATES**. Political wrangling and the American Civil War delayed construction for many years; the monument was finally completed in 1884. The official dedication took place on Feb. 21, 1885, and the monument was opened to the public three years later. It is administered by the National Park Service (q.v.). **WASHINGTON, MOUNT**, highest mountain of the N.E. United States, 23 miles N.W. of Conway, New Hampshire. It rises 6288 ft. above sea level and forms part of the Presidential Range of the White Mts. (q.v.). Forests cover its slopes to an elevation of about 3280 ft., beyond which it is bare and rocky. Mount Washington is noted for its scenery and for excellent skiing conditions, particularly at Tuckerman Ravine on the S.E. slope. A weather station and hotel are located at the summit, which may be reached by trail, automobile, and by cog railway; the Appalachian Trail (q.v.) crosses the upper slopes of the mountain. The peak was first scaled in 1642; in 1784 the American clergyman and pioneer Manasseh Cutler (1742–1823) climbed the mountain, and is believed to have named it.

WASHINGTON, TREATY OF, agreement signed in Washington, D.C., on May 8, 1871, by the United States and Great Britain that provided for both countries to submit their disputes to arbitration. One major point at issue was an American demand that Britain pay reparations for Union ships destroyed during the American Civil War by Confederate raiders built and equipped in England; see **ALABAMA CLAIMS**. Also at issue was the boundary dispute involving rival claims by the two nations to the San Juan Islands at the N. end of Puget Sound. Because of faulty wording in the treaty that settled the Northwest Boundary Dispute (q.v.) in 1846, the islands could have belonged to either country. Both disputes were eventually settled in favor of the U.S. The treaty also provided for a commission to settle the North-Atlantic fishing dispute; as a result both countries exchanged various fishing, navigational, and customs privileges in North America.

WASHINGTON UNIVERSITY, coeducational nonsectarian privately controlled institution of higher learning, located in Saint Louis, Mo. The university was founded in 1853 as Eliot Seminary, and the present name was adopted in

1857. The university comprises a college of arts and sciences (founded in 1859); school of continuing education (1908); schools of law (1867), engineering (1870), fine arts (1879), medicine (1891), dentistry (1892), architecture (1902), business and public administration (1917), and social work (1945); a graduate school (1922); a summer school (1924); Sever Institute of Technology (1948); and a graduate school of business administration (1958). The university gallery of art was founded in 1879. The degrees of bachelor, master, and doctor are conferred. Military training is offered by United States Army and Air Force Reserve Officers' Training Corps units in off-campus facilities.

In 1973 the university library contained 1,000,000 volumes, including several noted collections. Among the latter are the Pretorius collection in German, the Wulff collection in numismatics, and the Bixby collection of rare books and manuscripts. In 1973 student enrollment totaled 11,373, the faculty numbered 2202, and the endowment was about \$163,191,000.

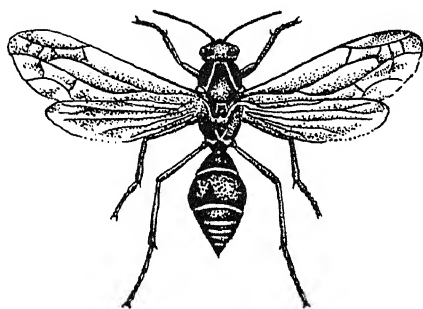
WASHINGTON, UNIVERSITY OF, coeducational State-supported institution of higher learning, located in Seattle, Wash., and opened for instruction in 1861. The university consists of six colleges and ten major schools. The colleges are architecture and urban planning (1957), arts and sciences (1861), education (1913), engineering (1896), fisheries (1919), and forest resources (1907). The major schools are the graduate school (1907), which includes a school of librarianship (1911); graduate school of public affairs (1961); school and graduate school of business administration (1917); and the schools of medicine, pharmacy (1894), law (1898), social work (1934), dentistry, and nursing (1945), and public health and community medicine (1970). The degrees of bachelor, master, and doctor, and professional degrees are conferred. United States Army, Navy, and Air Force Reserve Officers' Training Corps units have programs here.

The university maintains a 484-acre marine-sciences installation at Friday Harbor, in the San Juan Islands, and a 2300-acre demonstration forest at La Grande, Wash. It administers, with Washington State University, the Joint Center for Graduate Study in Hanford, Wash. The campus is the site of the Thomas Burke Memorial–Washington State Museum, which has extensive exhibits relating to Northwest Coast Indians and to Pacific Rim countries.

In 1972 the university library contained about 1,930,000 bound volumes, including an extensive collection of Pacific Northwest Americana. Enrollment in the same year totaled about

34,000 students, the faculty numbered about 3000, and the endowment of the institution was approximately \$57,000,000.

WASP, common name applied to any insect of the superfamilies Vespoidea and Sphecoidea, belonging to the order Hymenoptera (q.v.). Many different varieties of wasps exist, with widely varying habits and structural characteristics. They may be divided into two general types, the social wasps and the solitary wasps. Among the former are the hornets, the yellow jackets, and the large mahogany-colored wasps, known as the *Polistes*, which live in communities consisting of males, females, and sterile



Polistes wasp, genus *Polistes*

workers. The solitary wasps, including the mud daubers, potter wasps, and digger wasps, produce no workers and build individual nests.

Functions. The female and worker wasps are equipped with a sting, which is used to attack their prey or to protect them against molesters. Wasp venom contains histamine (q.v.) and a factor that dissolves red blood cells. A wasp sting can be fatal to a sensitive person. Desensitization can be accomplished by injections of antigen extracts; see **ALLERGY**.

Although adult wasps are largely carnivorous, some also eat vegetable matter, such as overripe fruit. As a rule young wasps are fed entirely on other insects or insect remains. Several species are of economic importance, for they assist in the pollination of commercial crops. Some are beneficial because they feed on such destructive caterpillars as the corn-ear worm and army worm. A species that is native to Africa is known to prey on the eggs of the rhinoceros beetle, an insect that causes immense damage in coconut-growing regions. Many parasitic varieties, which lay their eggs in the body or egg of the host, are useful in the control of some injurious pests such as aphids, codling moths, and bollworms; see **ENTOMOLOGY, ECONOMIC**.

Wasps vary greatly in size. Some of the para-

sitic wasps are so small that several may develop in a small insect egg. Other species attain a body length of about 2 in.

Nesting Habits. Social wasps build papery nests of masticated fibers. The nests of the yellow jackets and hornets are composed of several layers of cells enclosed in a globular outer covering. *Polistes* build open, flat nests of a single comb. The nest is begun by the queen wasp, which alone survives the winter. Her first eggs develop into workers, which continue the building of the nest and largely take over the care of the young. During a season a *Polistes* nest may become 6 to 8 in. in diameter and house several hundred wasps. There may be several thousand yellow jackets in one community.

The nesting habits of the solitary wasps are extremely diverse. The potter wasps build vase-like cells of clay attached to the twig of a tree. The mud daubers construct mud cells in sheltered places; the digger wasps burrow into the soil and sometimes in decaying wood. Solitary wasps generally provision the cells with spiders, caterpillars, or flies stung through the nerve center and thus rendered helpless. In this fashion the young insects are provided with fresh food. The digger wasp tamps down the earth with pebbles to fill the mouth of its burrow; this is the only known instance of the use of tools among the lower animals.

WASSERMANN, August von (1866–1925), German pathologist, born in Bamberg, and educated at the universities of Munich, Berlin, Strassburg, and Vienna. A student of the famous German bacteriologist Robert Koch (q.v.) at the University of Berlin, he was engaged in research at the Koch Institute of Infectious Diseases after 1890. He taught at the University of Berlin from 1902 to 1913, when he became director of the newly organized Kaiser Wilhelm Institute for Experimental Therapy in Berlin-Dahlem.

Wassermann is noted for his discovery in 1906 of a test used in the diagnosis of syphilis (q.v.). The test, known as the Wassermann reaction, determines whether antibodies to the syphilis microorganisms are present in the blood or the spinal fluid of a person. A positive reaction generally indicates the presence of the disease. The test is valuable because syphilis can be present for many years, causing great damage to the body, before it produces any symptoms. Wassermann also developed an antitoxin treatment for diphtheria and inoculations for cholera, tetanus, and typhoid fever (qq.v.).

WASSERMANN, Jakob (1873–1934), German novelist, born in Furth. As a young man living in

WATAUGA ASSOCIATION

Munich, he suffered extreme poverty. His novel *Die Juden von Zirndorf* (1896; Eng. trans., *The Dark Pilgrimage*, 1933) established his reputation. After 1898 he lived in Austria and traveled widely. Among the best known of his many novels are *Caspar Hauser* (1908; Eng. trans., 1928), *Das Gänsemännchen* (1915; Eng. trans., *The Goose Man*, 1922), and *Christian Wahnschaffe* (1919; Eng. trans., *The World's Illusion*, 1920). He also wrote an autobiography, *Mein Weg als Deutscher und Jude* (1921; Eng. trans., *My Life as German and Jew*, 1933), biographies, short stories, and essays.

Wassermann expresses in his novels his concern with the problems of injustice, unhappy marriage, racial intolerance, and the conflict between the older and younger generations. The rich storytelling qualities and ethical preoccupations of his characters made his works extremely popular during his lifetime, and many were translated into other languages. After his death, however, his popularity and reputation as a writer greatly declined.

WATAUGA ASSOCIATION, in American history, name of a semiautonomous government founded in 1772 by pioneer settlers in what is now northeastern Tennessee. The Indian boundary line, surveyed in 1771, left the settlers in Indian country, but instead of moving, as ordered by British officials, they leased their lands from the Cherokee Indians. Beyond the bounds of any organized government and fearing that their settlement might become a haven for outlaws, they organized a homespun government under what was called the Watauga Compact. This pact is believed to have been the first written constitution adopted by native-born Americans, and although the document was not preserved, it seems to have provided for a court of five judges, a clerk, and a sheriff, using the Virginia laws as a guide. When the Transylvania Company of Judge Richard Henderson (1735–85) negotiated at Sycamore Shoals, in the Watauga community, in March, 1775, a purchase from the Cherokee Indians of a large part of present-day Kentucky and Tennessee, the Wataugans were able to transform the lease of their lands into an outright purchase. With the beginning of the American Revolution (q.v.) in 1775, they supported the patriot cause and in accordance with the practice recommended by the colonial governments, created a thirteen-member committee of public safety, and renamed their government the Washington District. This was the first governmental subdivision named for General George Washington (q.v.). Threatened with an Indian attack in 1776, the Wataugans

asked for and obtained annexation by North Carolina. They were thus included in Washington County, which was created the next year for all of the State's Western claim. When that claim was ceded and then taken back in 1784, the Wataugans took the lead in organizing the short-lived State of Franklin; see FRANKLIN, STATE OF.

S.J.F.

WATCH. See CLOCKS AND WATCHES.

WATER, common name applied to the liquid state of the hydrogen-oxygen compound H_2O . Water was regarded by the ancient philosophers as a basic element typifying all liquid substances. Scientists did not discard that view until the latter half of the 18th century. In 1781 the British chemist Henry Cavendish (q.v.) synthesized water by detonating a mixture of hydrogen and air. However, the results of his experiments were not clearly interpreted until two years later, when the French chemist Antoine Laurent Lavoisier (q.v.) proved that water was not an element, but a compound of oxygen and hydrogen. In a scientific paper presented in 1804 the French chemist Joseph Louis Gay-Lussac and the German naturalist Baron Alexander von Humboldt (qq.v.) demonstrated jointly that water consisted of two volumes of hydrogen to one of oxygen, as expressed by the present-day formula H_2O .

Almost all the hydrogen in water has an atomic weight of 1. The American chemist Harold Clayton Urey (q.v.) discovered in 1932 the presence in water of a small amount (1 part in 6000) of so-called heavy water, or deuterium oxide (D_2O); deuterium (q.v.) is the hydrogen isotope with an atomic weight of 2. In 1951 the American chemist Aristid Grosse (1905–) discovered that naturally occurring water contains also minute traces of tritium oxide (T_2O); tritium (q.v.) is the hydrogen isotope with an atomic weight of 3. See ATOM AND ATOMIC THEORY.

Properties. Pure water is an odorless, tasteless liquid. It has a bluish tint, which may be detected, however, only in layers of considerable depth. Under standard atmospheric pressure (760 mm of mercury), the freezing point of water is $0^\circ C$. ($32^\circ F.$) and its boiling point is $100^\circ C$. ($212^\circ F.$). Water attains its maximum density at a temperature of $4^\circ C$. ($39^\circ F.$) and expands upon freezing. Like most other liquids, water can exist in a supercooled state; that is, it may remain a liquid although its temperature is below its freezing point. Water can easily be cooled to about $-25^\circ C$. without freezing, either under laboratory conditions or in the atmosphere itself. Supercooled water will freeze if it is disturbed, if the temperature is lowered fur-

The Hydrologic Cycle

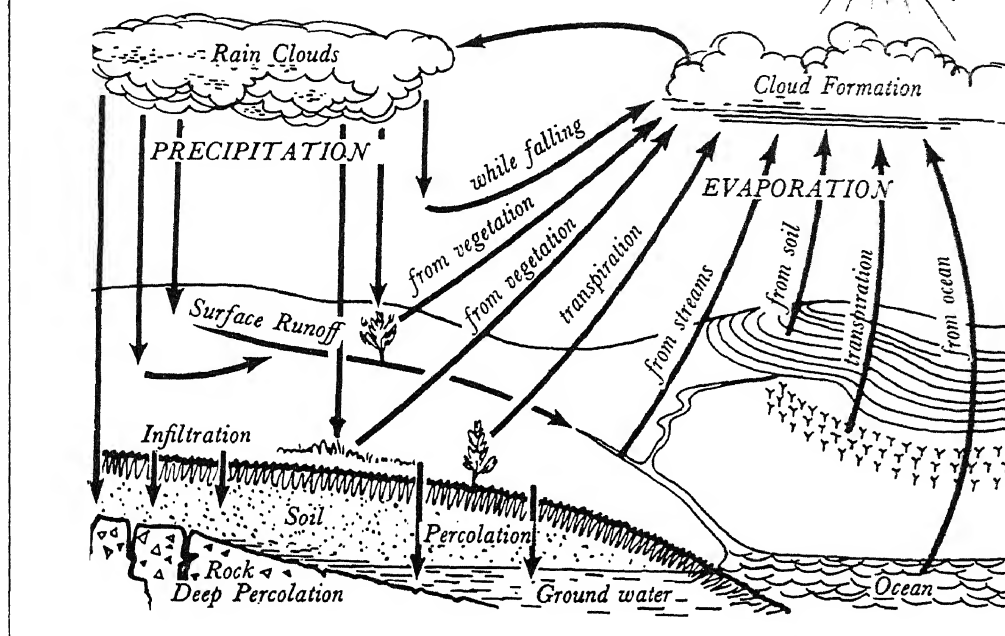


Diagram of the hydrologic cycle, the continuous movement of water between the earth and the atmosphere.
American Water Works Assn.

ther, or if an ice crystal or other particle is added to it. Its physical properties are used as standards to define the calorie and specific and latent heat (see HEAT) and in the metric system for the original definition of the unit of mass, the gram.

Water is one of the best-known ionizing agents; see IONIZATION. Because most substances are somewhat soluble in water, it is frequently called the universal solvent. Water combines with certain salts to form hydrates. It reacts with metal oxides to form bases, and with nonmetallic oxides to form acids (see CHEMISTRY). It acts as a catalyst in many important chemical reactions.

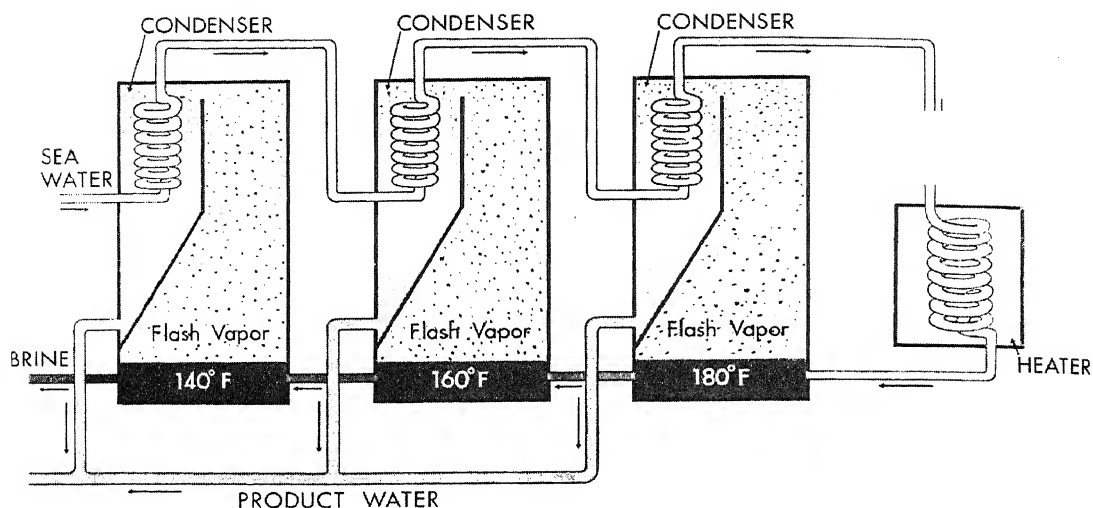
Occurrence. Water is the only substance that occurs at ordinary temperatures in all three states of matter, that is, as a solid, a liquid, and a gas. As a solid, or ice (q.v.), it is found as glaciers and ice caps, on water surfaces in winter, as snow, hail, and frost, and as clouds formed of ice crystals. It occurs in the liquid state as rain and as clouds formed of water droplets, and on vegetation as dew; in addition, it covers three quarters of the surface of the earth in the form of swamps, lakes, rivers, and oceans. As gas, or water vapor, it occurs as fog, steam, and clouds.

Atmospheric vapor is measured in terms of relative humidity, which is the ratio of the quantity of vapor actually present to the greatest amount possible at a given temperature. See ATMOSPHERE; CLOUD; FOG; HUMIDITY; RAIN.

Water occurs as moisture in the upper portion of the soil profile, in which it is held by capillary action to the particles of soil. In this state it is called bound water and has different characteristics from free water; see SOILS AND SOIL MANAGEMENT: *Soil Water*. Under the influence of gravity, water accumulates in rock interstices beneath the surface of the earth as a vast groundwater reservoir supplying wells and springs and sustaining the flow of some streams during periods of drought.

Water in Life. Water is the major constituent of living matter. From 50 to 90 percent of the weight of living organisms is water. Protoplasm, the basic material of living cells, consists of a solution in water of fats, carbohydrates, proteins, salts, and similar chemicals. Water acts as a sol-

WATER



Schematic diagram of a multistage flash distillation process used to produce fresh water from seawater.

Office of Saline Water

vent, transporting, combining, and chemically breaking down these substances. Blood in animals and sap in plants consist largely of water and serve to transport food and remove waste material. Water also plays a key role in the metabolic breakdown of such essential molecules as proteins and carbohydrates. This process, called hydrolysis, goes on continually in living cells.

Natural Water Cycle. Hydrology is the science concerned with the distribution of water on the earth, its physical and chemical reactions with other naturally occurring substances, and its relation to life on earth; the continuous movement of water between the earth and the atmosphere is known as the hydrological cycle. Under the influence of several factors, of which heat is predominant, water is evaporated from both water and land surfaces and is transpired from living cells. This vapor circulates through the atmosphere and is precipitated in the form of rain or snow; see *METEOROLOGY: Circulation of the Atmosphere*.

On striking the surface of the earth, the water follows two paths. In amounts determined by the intensity of the rain and the porosity, permeability, thickness, and previous moisture content of the soil, one part of the water, termed surface runoff, flows directly into rills and streams and thence into oceans or land-locked bodies of water; the remainder infiltrates into the soil. A part of the infiltrated water becomes soil moisture, which may be evaporated directly or may move upward through the roots of vegetation to be transpired from leaves. The portion of the water that overcomes the forces

of cohesion and adhesion in the soil profile percolates downward, accumulating in the so-called zone of saturation to form the groundwater reservoir, the surface of which is known as the water table. Under natural conditions the water table rises intermittently in response to replenishment, or recharge, and then declines as a result of continuous drainage into natural outlets such as springs.

Composition. Because of its capacity to dissolve numerous substances in large amounts, pure water rarely occurs in nature.

During condensation and precipitation, rain or snow absorbs from the atmosphere varying amounts of carbon dioxide and other gases, as well as traces of organic and inorganic material. In addition precipitation carries radioactive fallout to the earth's surface; see *RADIOACTIVE FALLOUT*.

In its movement on and through the earth's crust, water reacts with minerals in the soil and rocks. The principal dissolved constituents of surface and groundwater are sulfates, chlorides, and bicarbonates of sodium and potassium and the oxides of calcium and magnesium. Surface waters may also contain domestic sewage and industrial wastes. Groundwaters from shallow wells may contain large quantities of nitrogen compounds and chlorides derived from human and animal wastes. Waters from deep wells generally contain only minerals in solution. Almost all supplies of natural drinking water contain fluorides in varying amounts. The proper proportion of fluorides in drinking water has been found to reduce tooth decay substantially; see *FLUORINE*.

Seawater contains, in addition to concentrated amounts of sodium chloride, or salt,



A view of the desalination test facility operated by the Department of Interior's Office of Saline Water at San Diego, Calif.

Rapho/Photo Researchers

many other soluble compounds, as the impure waters of rivers and streams are constantly feeding the oceans. At the same time, pure water is continually lost by the process of evaporation (q.v.), and as a result the proportion of the impurities that give the oceans their saline character is increased. See OCEAN AND OCEANOGRAPHY: *Composition of Seawater.*

Water Purification. Suspended and dissolved impurities present in naturally occurring water make it unsuitable for many purposes. Objectionable organic and inorganic materials are removed by various methods, such as screening and sedimentation to eliminate suspended materials; treatment with such compounds as activated carbon to remove tastes and odors; filtration; and chlorination or irradiation to kill infective microorganisms. See also SEWAGE DISPOSAL.

Hardness of natural waters is caused largely by calcium and magnesium salts and to a small extent by iron, aluminum, and other metals.

Hardness resulting from the bicarbonates and carbonates of calcium and magnesium is called temporary hardness and can be removed by boiling, which also sterilizes the water. The residual hardness is known as noncarbonate, or permanent, hardness. The methods of softening noncarbonate hardness include the addition of sodium carbonate and lime and filtration through natural or artificial zeolites, which absorb the hardness-producing metallic ions and release sodium ions to the water; see ION EXCHANGE; ZEOLITE. Sequestering agents in detergents serve to inactivate the substances that make water hard; see CHEMICAL COMPOUNDS.

Iron, which causes an unpleasant taste in drinking water, may be removed by aeration and sedimentation or by passing the water through iron-removing zeolite filters, or the iron may be stabilized by addition of such salts as

WATER

polyphosphates. For use in laboratory applications, water is either distilled or demineralized by passing it through ion-absorbing compounds.

Water Desalinization. To meet the ever-increasing demands for fresh water, especially in arid and semiarid areas, much research has gone into finding efficient methods of removing salt from seawater and brackish waters. In the United States, desalinization research is directed by the Office of Saline Water, Department of the Interior. Several processes are being developed to produce fresh water cheaply.

Three of the processes involve evaporation followed by condensation of the resultant steam and are known as multiple-effect evaporation, vapor-compression distillation, and flash evaporation. The last-named method, the most widely used, involves heating seawater and pumping it into lower-pressure tanks, where the water abruptly vaporizes (flashes) into steam. The steam then condenses and is drawn off as pure water. In 1967, Key West, Fla., opened a flash-evaporation plant and thus became the first city in the U.S. to draw its fresh water from the sea.

Freezing is an alternate method, based on the different freezing points of fresh and salt water. The ice crystals are separated from the brine, washed free of salt, and melted into fresh water. In another process, called reverse osmosis, pressure is used to force fresh water through a thin membrane that does not allow the minerals to pass. Reverse osmosis is still undergoing intensive development. Electrodialysis is being used to desalt brackish waters. When salt dissolves in water it splits into positive and negative ions, which are then removed by electric current through anion and cation membranes, thus depleting the salt in the product water. Although developmental work on electrodialysis is continuing, a number of commercial plants are in operation. In 1962 Buckeye, Ariz., became the first town to have all its water supplied by its own electrodialysis-desalting plant, which provides 650,000 gal. of water daily at a cost of about 60 cents per 1000 gal.

Much research is being carried out on the use of atomic energy for desalinization. Although conventional fuels, such as coal and oil, are more efficient in smaller-scale plants, studies have shown that nuclear power is cheaper in most plants producing 25,000,000 or more gal. of fresh water a day. Although no such plants have yet been built, plans for large-scale dual-purpose water-desalting and power installations are well under way in water-poor areas such as Israel and southern California. The largest such

plant is slated to be completed in the early 1970's on a 40-acre man-made island 26 mi. offshore from Huntington Beach, south of Los Angeles, Calif. It will produce 150,000,000 gal. of fresh water per day, enough to meet the needs of a city of 750,000 population, and will also generate 1,800,000 kw of electricity.

One major problem in desalinization projects is the cost of producing fresh water. Using conventional fuels, plants with a capacity of 1,000,000 gal. per day or less produce water at a cost of \$1 or more per 1000 gal. More than 500 such plants are in operation, with a total capacity of nearly 125,000,000 gal. a day; however, their high costs limit their use to areas of great water scarcity. Water from conventional sources, such as wells and reservoirs, is sold for less than 30 cents per 1000 gal. delivered to the home, and water for irrigation is usually priced at less than 5 cents per 1000 gal. The large dual-purpose atomic-power and water-desalting plants now being planned are designed to produce fresh water for between 20 cents and 30 cents per 1000 gal. Piping the water to the point of need would add several cents to this cost.

Most experts expect more immediate results from efforts to purify mildly brackish water that contains between 1000 and 4500 parts per 1,000,000 of minerals, compared to 35,000 parts per 1,000,000 for ocean water. Because water is potable if it contains less than 500 parts per 1,000,000 of salt, the cost of desalting brackish water is correspondingly less than it is for desalting seawater; see SOLAR POWER. See also NUCLEAR POWER; WATERPOWER; WATER SUPPLY AND WATERWORKS: *Seawater Desalinization*.

For other functions of water, see EROSION; GEOLOGY; METABOLISM.

S.Z.L. WATER BEETLE, common name for any of numerous aquatic beetles of the families Dytiscidae, Gyrinidae, and Hydrophilidae, belonging to the order Coleoptera. The family Dytiscidae, which contains the true, or diving, water beetles, contains approximately 2000 species native to land areas throughout the world. The principal genus, *Dytiscus*, is commonly found in temperate and subtropical regions of America. The hardened elytra, or wing covers, which are usually grooved in the female and smooth in the male, form a cavity above the body proper. The beetles rise periodically to the surface of the water to draw a fresh supply of air into the elytra cavity. Because of their rapacity, water beetles are also known as water tigers. The adults hibernate in the underwater soil during a large part of the year, but are usually active in spring; they feed on insects.

The family Gyrinidae, consisting of the whirligig beetles, contains approximately 400 species native to the temperate and tropical regions throughout the world. Whirligig beetles spend most of their life on the surface of the water, but can dive to considerable depths; like the diving beetles, they are equipped with an air cavity under the elytra. They hibernate during the cold months of the year, but come to the surface periodically for their characteristic whirling motions or dances. The principal genus, *Dineutes*, contains approximately 30 species, which are widely distributed. The adults are lustrous black above, and are yellow, black, or brown below. The body, like that of the diving beetle, is elliptical and convex.

The family Hydrophilidae consists of the water scavenger beetles, and contains about 2000 species. They are worldwide in distribution, but abundant in the warmer regions. Most species feed on vegetable matter, but some prey upon small aquatic animals. They are usually dark colored and shiny, and elliptical in shape. Water scavenger beetles do not swim as rapidly as the diving or whirligig beetles; most species are aquatic or amphibian, but a few are terrestrial.

See also BEETLE.

WATER BOATMAN. See WATER BUG.

WATERBUCK, name applied chiefly to two species of large antelope (q.v.), belonging to the genus *Kobus*, and native to southern and eastern Africa. The waterbuck is more than 4 ft. tall and has a coarse, shaggy coat that is generally reddish brown in color. The species *K. ellipsiprymnus* has a white elliptical ring on the buttocks. This ring is lacking in the other species, *K. defassa*, known also as the sing-sing. The adult males of both species have long, ringed horns.

The waterbuck roves in small herds near marshes or rivers, to which it runs for refuge when alarmed. The name "waterbuck" is sometimes applied to other closely related species of antelope.

WATER BUFFALO. See BUFFALO.

WATER BUG, common name for aquatic insects of several families in the order Hemiptera (see BUG), and including water boatmen, Corixidae; back swimmers, Notonectidae; and water scorpions, Nepidae. The name "water bug" is sometimes restricted to members of the family Belostomatidae.

WATERBURY, city in Connecticut, and one of the two county seats of New Haven Co., on the Naugatuck R., 18 miles N.W. of New Haven. It is noted as the brass-manufacturing center of the United States. In addition to the brass industry,

which dates from 1802, the manufacture of clocks and watches is another well-known industry of Waterbury. Other leading products include chemicals, flexible tubing, toys, automobile parts, and electro-mechanical devices. Among the points of interest are The Green, around which the original settlers built their homes, and near the site of many of the present-day public buildings; Fulton Park; the Mattatuck Historical Society; the Waterbury Branch of the University of Connecticut, and Post Junior College, established in 1890. Originally settled in 1674 as part of Farmington, Waterbury was incorporated as a separate town in 1686 and chartered as a city in 1853. It suffered heavy damage by floods in August, 1955, that were caused by hurricanes and subsequent rains. Pop. (1960) 107,130; (1970) 108,033.

WATER CHESTNUT, common name applied to aquatic herbs of the genus *Trapa* and to their nutlike fruit, and also to the Chinese sedge, *Eleocharis tuberosa*, and its edible tuber. The tuber of the sedge, known popularly as the Chinese water chestnut, is sweet and starchy and is employed extensively in Chinese cookery.

The genus *Trapa* contains three species native to warm areas of the Eastern Hemisphere, and is known also as water caltrop because the fruit of these herbs have spinelike projections. *Trapa bicornis* bears a two-horned nut widely eaten in China. The singhara nut is often used as food in India and Ceylon. The species *T. natans* bears floating leaves 4 in. in length and has become a pest in northeastern United States, where it clogs waterways.

WATER CLOCK. See CLEPSYDRA.

WATERCOLOR PAINTING, or **AQUARELLE**, art of painting with colored pigments dissolved in water and bound together by an adhesive material, such as gum arabic; also a work produced by this method. Watercolor ranks as one of the major art media because of the variety, brilliance, and delicacy of the results attainable, as well as the cheapness of the materials used and the ease of execution. Paintings in watercolor can convey, to a greater degree than works in any other medium, a remarkable sense of movement and evanescence.

Watercolor paintings are of two basic kinds, those in which the pigments are mixed with substances like egg albumin or Chinese white, which make the colors opaque; and those in which the colors are translucent so that light is reflected from the paper or fabric on which the paint is applied rather than from the paint itself. For descriptions of the various types of opaque watercolor paintings, see **FRESCO**; **PAINTING**,



A watercolor painting from The Green Book, a 19th-century collection of anonymous flower illustrations. Although watercolor is often used with great freedom to create expressive, spontaneous effects, it can also be handled in a highly controlled way to produce convincingly accurate detail and gradations of tone, as in this illustration.

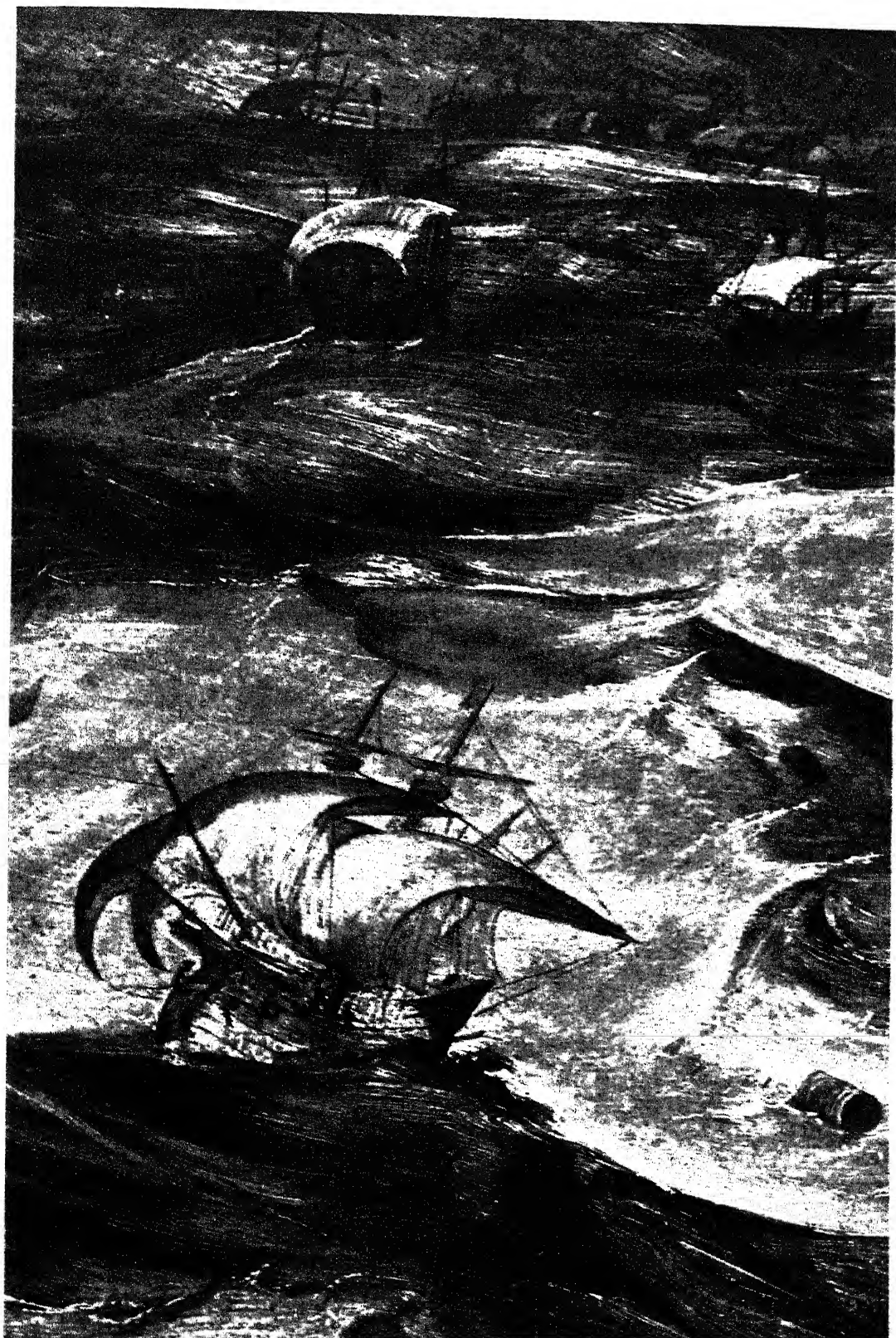
Free Library of Philadelphia-
Joseph Martin/Scala

ENCAUSTIC; TEMPERA PAINTING. Only watercolor paintings proper, that is, compositions in which the colors are wholly or in large part translucent, are discussed in this article. Translucent watercolor paintings may be of two types, namely wash drawings, in which the outlines are first drawn with pen and ink or with pencil and the colors then applied to areas, and pure watercolors or aquarelles, in which only translucent watercolors are used.

Materials and Techniques. For the best results, the watercolorist uses heavy white paper, preferably handmade and with linen content. Such paper will not wrinkle and will absorb the water, permitting the colors to dry evenly on the surface. The most suitable brushes are larger than those used in oil painting and are made of soft hairs, such as sable and camel, which will

retain moisture and come to a point. Because impurities muddy the paintings, it is important that both the water and the pigments be as pure as possible. The fewer the pigments used, the easier it is to preserve purity. Watercolor pigments are prepared either in small cakes or in tubes. In painting, the artist dampens the brush, rubs it over the pigment, and then applies it to the paper. The degree of dilution of the pigment is controlled by the artist's touch.

During the late 18th and early 19th centuries British watercolorists used highly diluted pigments, which they superimposed layer upon layer. By means of this technique they achieved meticulous detail and careful shading of tones. More recently, artists have tended to seek spontaneity by applying more saturated colors in single layers, a technique which ensures a brilliant,



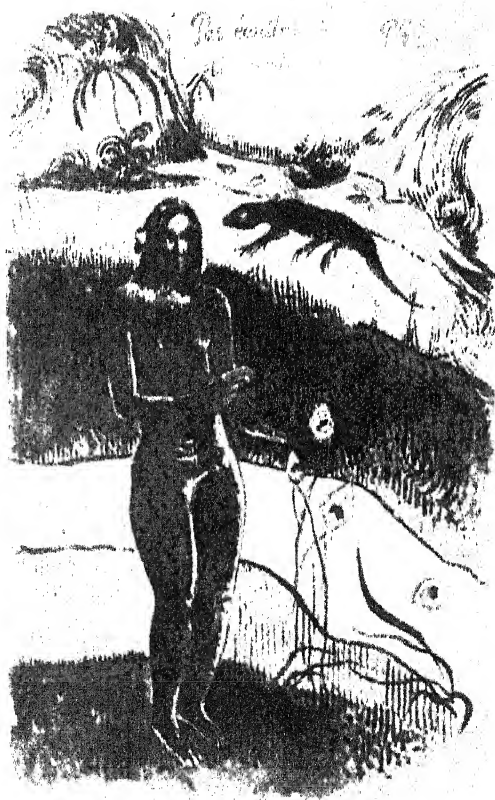
Watercolor Painting. Plate 1. Detail from "Storm at Sea" (1567) by Pieter Brueghel, known as Pieter the Elder, the great Flemish painter of the 16th century.



National Gallery of Art, Washington, D.C. Alfred Stieglitz Collection

Watercolor Painting. Plate 2. Above: The bold watercolor composition "Echo Lake" was painted in 1927 by the foremost American watercolorist John Marin, renowned for his semicubist New England land- and seascapes. Below, left: One of several similar watercolor works of the French painter Jacques Villon (1875–1963), noted for his angular yet delicate female forms. Below, right: The exotic ink and watercolor "Nave Nave Fenua" ("Wonderful Earth") was executed on the island of Tahiti by the postimpressionist French painter Paul Gauguin between 1894 and 1900.

National Gallery of Art, Washington, D.C. Rosenwald Collection





"Scene at Houghton Farm" (about 1878), a watercolor painting by Winslow Homer, one of America's major watercolorists.
Hirshhorn Collection-Scala

sparkling effect heightened by the whiteness of the paper where it remains untouched or shines through the layer of paint. Success with this technique requires a sure, swift hand; the colors dry so rapidly that the desired tone must be created with the first brush stroke.

History. Watercolor painting was practiced by the artists of various ancient civilizations, including Egypt, but the art reached its highest stage of development in China. There, from the earliest times, it was a leading art medium. From China, the art spread to Japan, where it took more colorful and intricate, though less subtle, forms. Chinese watercolors also influenced the artists of Persia, but the art had developed independently in that country in the 9th or 10th century. See CHINESE ART; JAPANESE ART AND ARCHITECTURE; PERSIAN ART AND ARCHITECTURE.

In Europe, most of the illuminations in medieval manuscripts were watercolors, and many of the earliest woodcuts were hand tinted with color washes. The first major development of the medium in Europe, however, was accomplished by the German artist Albrecht Dürer. Dürer not only executed masterful wash drawings, including the famous "Young Hare" (1502, Graphics Collection, Albertina Library, Vienna), but also painted excellent monochromatic (one-color) aquarelles. Many great painters of the 16th and 17th centuries, including the Dutch painter Rembrandt and the Flemish painter

Peter Paul Rubens, used wash drawings as preliminary sketches for oil paintings. Many of these drawings are recognized as masterpieces in their own right.

The next step in the development of watercolor technique was taken by such Dutch artists as Paul Brill (1554–1626) and Cornelis Dusart (1660–1704), who executed wash drawings of landscapes, first in two colors, shades of brown and blue, and then in many colors.

Artists did not begin to specialize in watercolor painting, however, until the 18th century. The first school of watercolor specialists arose in England in response to the contemporary landed gentry's craze for drawings of their country seats and of rural scenes generally. The first sketches produced for this trade were simple line drawings. Then it was found that better effects could be produced by tinting certain areas with watercolor washes. Finally, the British artists discovered that by using watercolor alone they could achieve greater accuracy and finer tone.

The first great master of the British school of watercolorists was Paul Sandby (1725–1809). Sandby's paintings have a captivating freshness and charm. The British artists Alexander Cozens (1717?–86) and later his son John Robert Cozens

WATERCRESS

(1752–97), Thomas Girtin, Thomas Rowlandson, and others contributed to the refinement of the art. The British mystical poet and artist William Blake did some of his best work in watercolors, a medium he preferred to any other. Perhaps the most distinguished work, however, came from the brush of the British landscape painter Joseph Mallord William Turner, whose landscapes and seascapes give the impression of having been made with colored steam.

The British watercolor school declined during the second half of the 19th century. Aside from the nocturnes of the American painter James Abbott McNeill Whistler, who lived in London, and the pre-Raphaelite paintings of the British artists Edward Coley Burne-Jones and Dante Gabriel Rossetti, most British watercolors of that period were executed to please popular taste.

In France, Ferdinand Victor Eugène Delacroix, Jean Louis André Théodore Géricault, Eugène Louis Gabriel Isabey (1804–86), Honoré Daumier, and other artists were introduced to the art by Richard Parkes Bonington, a British watercolorist who lived on the Continent. Later in the 19th century the French painter Paul Cézanne executed notable watercolor paintings. Elsewhere in Europe, the paintings of the Dutch artist Jozef Israëls (1824–1911) and of the German artist Adolph Friedrich Erdmann von Menzel (1815–1905) are particularly noteworthy.

The Art in America. Watercolor became a leading medium in the United States late in the 19th century. Winslow Homer, one of the greatest of American artists, produced his best work in watercolors. His seascapes, full of movement and shimmering light, communicate a rare vigor and spontaneity. Other distinguished American watercolorists are John Singer Sargent, John LaFarge, and Childe Hassam. Perhaps the leading 20th-century American watercolorist was John Marin, who expressed explosive violence with the strictest discipline. Outstanding among 20th-century European watercolorists were the Swiss painter Paul Klee, the British painter Paul Nash (1889–1946), the German painter Emil Nolde (1867–1956), and the French painters Raoul Dufy and Henri Matisse.

See separate biographies for persons whose birth and death dates are not given.

WATERCRESS, common name applied to an aquatic perennial herb, *Nasturtium officinale*, belonging to the mustard family, Cruciferae. The herb, which is native to Europe, is cultivated in springs and wet grounds in temperate climates, for use as food in salads and garnishes. The yellow or white flowers have four sepals, four petals, six stamens, and a solitary pistil. The

fruit is a long slender silique, or elongated capsule. Watercress is grown from either seed or cuttings. After the flower buds bloom, the leaves become extremely pungent, and can no longer be used as food; see **CRESS**.

WATER CYCLE. See **WATER: Natural Water Cycle**.

WATER DOG. See **MUD PUPPY**.

WATERFALL, sudden sheer descent of a stream or river (q.v.) over a steep drop in its bed, sometimes in a free fall. The term "cataract", commonly designating a series of rapids in a large river, is often applied to waterfalls of large volume. Waterfalls of any height that have a small volume of water or are one of a series of falls are termed cascades. The term "cascade" is also applied to a waterfall if, while plunging, it maintains contact with the stream bed. The highest waterfalls frequently are cascades. Waterfalls are valuable today as sources of hydroelectric power; see **WATERPOWER**.

How Waterfalls Are Formed. Waterfalls develop in several ways. Different rates of erosion (q.v.) where a resistant layer of rock in a stream bed overlies softer layers is the principal manner. Subsequent erosion of the softer rock by the falling water undermines and periodically breaks off portions of the harder cap rock. Some of the largest cataracts in the world, Niagara Falls in North America and Victoria Falls (qq.v.) in Africa, for example, originated in this way.

Waterfalls in mountainous regions generally develop where a glacier (q.v.) has deepened a major trunk valley, leaving less eroded branch valleys hanging; the tributary streams in these valleys discharge into the main river by falls or cascades. Hanging valleys also develop where a main river deepens its channel more rapidly than its tributaries do. Such falls are among the highest in the world. Bridalveil, Ribbon, and Upper and Lower Yosemite falls in Yosemite National Park (q.v.), Multnomah Falls (620 ft.) on a minor tributary of the Columbia R. in Oregon, Gavarnie (1385 ft.) in France, Sutherland Falls (1904 ft.) in New Zealand, and Staubbach (q.v.) in Switzerland, for instance, all descend from hanging valleys.

Other waterfalls originate where a fault (q.v.) uplifts a mountain range or part of a range, creating a fault scarp over which streams drop steeply. Continued undercutting and erosion of the edge and of the rock bed above the falls move many waterfalls upstream; these ultimately diminish in size, dwindle to rapids, and then disappear.

Famous Falls. Especially voluminous or spectacular waterfalls not previously mentioned in-

Victoria Falls (Mosi-Ao-Tunya), a waterfall on the upper Zambezi River, on the frontier between Zambia and Rhodesia, in south-central Africa. About a mile wide at this point, the river abruptly drops some 400 ft. The roar and the cloud of mist created can be observed at a distance of more than 20 mi. Although far from the highest falls in the world (Angel Falls in Venezuela is more than eight times as high), it is certainly one of the most spectacular.

Carl Frank-Photo Researchers



clude Angel Falls (3212 ft.) in Venezuela; Tugela (3110 ft.) in Natal, South Africa; Cuquenán (2000 ft.) in Venezuela; Takakkaw (1650 ft.) in British Columbia; King George VI Falls (1600 ft.) in Guyana; Krimml (1250 ft.) in Austria; Silver Strand Falls (1170 ft.) in California; Wollomombi (1100 ft.) in Australia; Gersoppa (830 ft.) in India; and Iguassú Falls (q.v.). The given length measurements for some of these falls involves more than one leap.

WATER FLEA, common name applied to minute freshwater crustaceans, belonging to the suborder Cladocera; see CRUSTACEA. As the name implies, water fleas move through the water with rapid, darting leaps. They are found in ponds and ditches throughout the United States

and Europe. A typical form, *Daphnia pulex*, is less than $\frac{1}{16}$ in. in length. It is globular in shape and reddish in color, and is encased in a transparent, bivalve shell. The head bears feathery, branched antennae which are used for swimming. The water flea reproduces rapidly, and is therefore useful for experiments in genetics and as a food for fish.

WATERFORD, maritime county of the Republic of Ireland, in Munster Province, on the Atlantic Ocean, bordered on the n. by counties Tipperary and Kilkenny, on the e. by County Wexford, and on the w. by County Cork. Except in the e. portion, the terrain is generally mountainous; the principal ranges are the Knockmealdown Mts. (2609 ft.) and the Comeragh

WATERFORD

Mts. (2504 ft.). The coastline is low, dangerous, and indented by many inlets, including Waterford Harbour, Tramore Bay, and Dungarvan Harbour. The principal rivers are the Blackwater and the Suir. Mineral deposits include copper, iron, lead, marble, quartz, and limestone. Dairy farming and the raising of cattle, pigs, and sheep are the chief occupations; the fisheries are also important. Industrial establishments include flour and textile mills, breweries, tanneries, and glassworks. Waterford (q.v.) is the county seat. Other towns are Dungarvan, Tramore, Kilmacthomas, and Lismore. Area, 710 sq.mi.; pop. (1971) 77,315.

WATERFORD, city in the Republic of Ireland, and county seat of County Waterford, on the Suir R., at the head of Waterford Harbour, about 75 miles s.w. of Dublin. It is one of the chief seaports of Ireland and the headquarters of an extensive export trade in meat, dairy products, and agricultural produce. The processing of food products, shipbuilding, and the manufacture of glass, known as Waterford glass, are also important. Among the landmarks are Reginald's Tower, on the site of a tower built in 1003; Blackfriar's Priory (1226); and the Protestant and Roman Catholic cathedrals, both dating from the 18th century.

History. Settled early in the Christian era, when it was known as Cuan-na-groith, the site of present-day Waterford was occupied in the 9th century by the Danes, who named it Vader Fjord. In the 12th century the settlement was seized by the English. Waterford received its charter of incorporation in 1206. In later times it became an anti-Protestant stronghold. Waterford withstood the forces of the English statesman Oliver Cromwell (*see under CROMWELL*) in 1649 but fell to the Parliamentarians in 1650. James II (q.v.), King of England, embarked (1690) for France from Waterford after his defeat in the Battle of the Boyne. Pop. (1971) 31,968.

WATER GAS, low-value flammable and poisonous gas, mixture of hydrogen and carbon monoxide (qq.v.), and usually small quantities of nitrogen, methane, and carbon dioxide (qq.v.). It was formerly used in welding (q.v.) and lighting, and as a source of hydrogen. *See GAS: Producer and Blast-Furnace Gases.*

WATERGATE, a complex of office and apartment buildings in Washington, D.C., that was the scene of an illegal wiretap and attempted burglary of the offices of the national headquarters of the Democratic Party (q.v.) on June 17, 1972, about three weeks before the Democratic National Convention was to open in Miami Beach, Fla. The exhaustive investigations fol-

lowing the break-in brought forth conflicting charges of political espionage, sabotage, forgery, and perjury involving high officials in the administration of President Richard M. Nixon (q.v.). In March, 1974, the President himself was named, by a Federal grand jury in Washington, D.C., an unindicted coconspirator in a conspiracy to obstruct justice. Finally, on Aug. 9, 1974, the President resigned. The word Watergate became synonymous with a whole series of unethical and irregular acts associated with the Nixon administration. Many of these acts, however, were only remotely connected with the Watergate break-in.

Background. At 2:30 A.M. on June 17, five men were arrested on the premises of the national headquarters of the Democratic Party. The intruders were apprehended and charged with second-degree burglary. After first giving false names, they identified themselves as James Walter McCord, Jr. (1924–), a retired official of the Central Intelligence Agency, later serving as security coordinator of the Committee for the Re-election of the President (CREEP), and four Cuban-Americans: Bernard L. Barker, Virgilio R. Gonzalez, Eugenio L. Martinez, and Frank A. Sturgis. Everett Howard Hunt, Jr. (1918–), a former agent of the C.I.A., and George Gordon Liddy (1930–), a former counsel to CREEP, were indicted as coconspirators. The trial of the seven conspirators began Jan. 8, 1973, in the U.S. district court for the District of Columbia, with John Joseph Sirica (1904–) as the presiding judge; all were convicted and sentenced to various terms in prison.

Three days after the arrest, President Nixon's press secretary, Ronald L. Ziegler (1939–), dismissed the break-in as "a third-rate burglary attempt". About the same time the Department of Justice (q.v.) announced that the Federal Bureau of Investigation had launched a full-scale investigation of the illegal activities. Throughout the remainder of 1972, while the country was involved in the Presidential election campaigns, the case was slowly building into what was to become the greatest political scandal in United States history. On several occasions the President reported that no one in the Administration or the White House was involved in the Watergate affair. By the spring of 1973, however, the Watergate break-in was seen by many political observers as but one part of a massive conspiracy and political espionage allegedly supervised by high-ranking members of the White House staff and of CREEP, who from the beginning had participated in covering up the involvement of higher officials.

Congressional Investigations. On Feb. 7, 1973, the U.S. Senate created a seven-member Senate Select Committee on Presidential Campaign Activities, later popularly known as the Watergate committee. It was also referred to as the Ervin committee, after its chairman, Senator Samuel James Ervin, Jr. (1896–), a Democrat of North Carolina. The vice-chairman was Howard H. Baker, Jr. (R, Tenn.). Public hearings began on May 17. By the end of the year testimony had been collected from several prominent former members of the Nixon administration and many other persons, including three of the Watergate conspirators. The hearings were adjourned in December, 1973; when reconvened in January, 1974, they were no longer public. The 2250-page report of the committee, released July 13, 1974, did not make specific accusations. It did, however, present thirty-five recommendations for election campaign reform, some of which were later enacted into law.

Among the officials whose testimony was heard were John W(esley) Dean III (1938–), counsel to the President from 1970 to April 30, 1973, when his resignation was requested; John Daniel Ehrlichman (1925–), chief domestic adviser to the President from 1969 to April 30, 1973; H(arry) R(obbins) Haldeman (1926–), who was the President's chief of staff from 1969 to April 30, 1973; and John Newton Mitchell (q.v.), attorney general of the U.S. from 1969 to February, 1972, when he resigned to become director of CREEP. Some who testified proved to be apologists for the Administration; others, led by Dean, stated that Nixon had full knowledge of the attempts to cover up the break-in. Jeb Stuart Magruder (1934–), who served as assistant secretary of commerce and chief of staff of CREEP, said that he, Mitchell, Dean, and others had approved the Watergate operation. He also identified Haldeman, among others, as one who took part in or knew about the cover-up. On June 16 a former White House aide, Alexander Porter Butterfield (1926–), revealed that an automatic recording system had been taping the President's conversations in his office and on the telephone since the spring of 1971. The revelation triggered a whole new phase of the Watergate investigation that centered on the tapes of the President's conversations.

The committee also heard testimony from executives of several large corporations that they had been pressured into making illegal corporate campaign contributions to the Nixon re-election effort.

Other Congressional committees investigated

certain aspects of Watergate. A House Armed Services special subcommittee, looking into the role of the Central Intelligence Agency, reported that agency officials were "unwitting dupes" for "purely domestic White House staff endeavors that were beyond the realm of C.I.A. authority".

An important admission made outside of the committee hearings was that of Charles Wendell Colson (1931–), special counsel to the President from 1969 to 1973. He conceded that he raised \$5000 to finance a burglary in September, 1971, at the office of the psychiatrist of Daniel Ellsberg, who in 1971 delivered to the press a copy of the so-called Pentagon papers (see CENSORSHIP: *Censorship in the United States: Political Censorship*). In June, 1974, Colson was convicted on one count of conspiracy to obstruct justice in the Ellsberg case and agreed to cooperate with the House Judiciary Committee and other agencies investigating Watergate.

The Special Prosecutor. On April 30, 1973, the President, on national television, announced that there had been an effort to conceal from him the facts in the Watergate case and he denied any personal knowledge of the cover-up. He accepted responsibility for Watergate but maintained his own innocence in the case. He authorized the setting up of a special prosecutor's office, independent of the Department of Justice. On May 18, Archibald Cox (1912–), a former solicitor general of the U.S., was named to the post.

The Senate committee and the special prosecutor requested nine of the White House tapes believed to contain discussions on Watergate. The President refused the request, citing the Constitutional separation of power and the need to protect confidential Presidential conversations. Cox, however, continued his efforts to secure the tapes through the courts, steps regarded by the President as exceeding the mandate of his commission.

On Oct. 20 the President ordered the dismissal of Cox for refusing to accept a compromise plan in which summaries and verbatim transcripts of White House tapes would be made available. Three days later, Nixon, forced by adverse popular and Congressional reaction, offered the nine tapes in their entirety to the court. (They were delivered Nov. 26.) Leon Jaworski (1905–), a former president of the American Bar Association, was chosen as the new special prosecutor. Jaworski, in conjunction with the House and Senate committees and the three grand juries investigating the case,

WATERGATE

was involved in a long and complicated series of legal actions. Various public figures were indicted, many of them several times. Some figures in the case began to serve prison sentences; some (including Dean and Magruder) were released early in 1975 after serving only a short time.

The last of the three grand juries continued to sit until July 3, 1975; shortly before its dissolution it took testimony from Nixon himself. The case, however, continued to be prosecuted by Henry S(wartley) Ruth, Jr. (1931–), who had succeeded Jaworski in October, 1974.

The Tapes Controversy. Meanwhile, the tapes continued to be the center of disagreements between the President and the various investigative agencies and agents. Many of the tapes and other pertinent materials were requested by the House and Senate committees, by the grand juries, and by the special prosecutor. Nixon invoked executive privilege and refused to surrender them. It was stated that some conversations had never been recorded or were missing entirely; others contained poor sound reproduction and partial gaps. Subpoenas issued to the White House were sometimes ignored and sometimes partially honored. In April the President made public and turned over to the House Judiciary Committee edited transcripts of thirty-one conversations. On July 24, 1974, the Supreme Court of the United States ruled in response to a plea from the special prosecutor. In a unanimous decision the Court found that Presidential privilege did not extend to materials, such as the tapes, that might prove evidential in criminal trials. The President, in compliance, released on Aug. 5 the transcript of a recording that proved he had ordered the F.B.I. investigation of the break-in halted on June 23, 1972. The President stated, upon releasing the transcript, that he had thereafter kept his order secret from the investigative bodies, his counsel, and the public.

Question of Impeachment. On Oct. 30, 1973, the House Committee on the Judiciary under the chairmanship of Peter W. Rodino, Jr. (1909–), Democrat from New Jersey, began to consider whether impeachment proceedings against the President were warranted. Through July, 1974, committee deliberations and hearings continued, finally leading to the approval of three articles of impeachment for reporting to the full House. The President was charged with obstructing justice by engaging in a cover-up of the Watergate burglary, abusing Presidential power by the misuse of and interference with Federal agencies, and defying subpoenas issued

by the committee for materials necessary to its investigation of the possibility of his impeachment. On Aug. 20, the House of Representatives voted 412–3 to accept the report of the committee, thus terminating impeachment proceedings.

Resignation. The ultimate effect of Watergate was the resignation, for the first time in history, of a President of the U.S. On Aug. 8, 1974, Nixon announced that he was resigning, effective Aug. 9, because he no longer had “a strong enough political base in the Congress” to continue the effort he had made to govern “throughout the long and difficult period of Watergate”.

In September, 1974, Gerald R. Ford (q.v.), who had succeeded Nixon, granted the former President a full pardon for any Federal crimes he might have committed during his years in the White House. The full truth about Watergate, it appeared, would never be known. But the effects of the affair, notably in the area of political verisimilitude, would probably be lasting.

WATER GLASS, glassy, colorless compound of sodium or potassium silicate, of formula Na_2SiO_3 ; see GLASS; SILICON. It is soluble in water and alcohol and is used commercially as a cement, in concrete (qq.v.), as a wall-coating and fireproofing material, in soap and synthetic detergents (qq.v.), and in petroleum-refining processes. Water-glass solution is also used to preserve eggs and wood.

WATER HEMLOCK. See HEMLOCK.

WATER HEN or MOOR HEN. See GALLINULE.

WATER HYACINTH, common name applied to a perennial, tropical, aquatic herb, *Eichhornia crassipes*, belonging to the pickerelweed family, Pontedariaceae. Introduced from South America, the herb has become naturalized in the southern United States and is widely cultivated as a tank or pond plant. The yellow-spotted, light-blue flowers, which are arranged in a loose spike about 12 in. above the leaves, have a six-parted calyx, a six-lobed corolla, three stamens, and a solitary pistil. The fruit is a many-seeded capsule. The swollen leaf stalks contain many air chambers, so the water hyacinth floats high on top of the water. The plant grows so abundantly in the rivers of many warm countries as to obstruct the passage of ships and large sums are spent in attempts to control it. The plant is sometimes used as a source of fiber for paper.

WATER LILY or POND LILY, common name applied to aquatic, perennial herbs of the family Nymphaeaceae, and to its principal genus *Nymphaea*. The genus, which contains approximately eighty distinct species and numerous varieties, is native to the Northern and Southern hemispheres and is cultivated throughout the

world. Water lily flowers float on the surface of the water or rise a few inches above the surface; the leaves are round or oval, and are 2 to 24 in. in diameter. In cultivation, water lilies are designated as hardy or as tropical, and the tropical species are further designated as day-blooming and night-blooming. Hardy water lilies are cultivated as perennials, whereas tropical water lilies are cultivated as annuals, and are showier than hardy species.

The fragrant white water lily, *N. odorata*, is native to the eastern United States. The common night-blooming water lily, *N. lotus*, known also as white lotus, is native to the Arab Republic of Egypt. See LOTUS.

WATERLOO, city in Iowa, and county seat of Black Hawk Co., on the Cedar R., about 92 miles N.E. of Des Moines. The leading industrial city of the State, Waterloo is also the trading center of a rich dairying and livestock- and poultry-raising area. The principal industrial establishments of the city include meat-packing plants and factories producing farm equipment. Gates Business College (1884) is located in Waterloo, and the city is the site of the annual Dairy Cattle Congress and International Belgian Horse Show, which attract livestock exhibits from many foreign countries. Known originally as Prairie Rapids, the community was founded in 1845. It was renamed Waterloo in 1851 and incorporated as a city in 1868. Pop. (1960) 71,755; (1970) 75,533.

WATERLOO, BATTLE OF, final and decisive action of the Napoleonic Wars (q.v.), fought on June 18, 1815, near Waterloo, Belgium. The battle ranks as a great turning point in modern history, for it effectively ended French domination of the European continent and brought about drastic changes in the political boundaries and the power balance of Europe. See FRANCE: *History: Restoration of the Bourbons*; NAPOLEON I.

Background of the Battle. After raising France to a position of preeminence in Europe from 1804 to 1813, the French emperor Napoleon I met defeat in 1814 by a coalition of major powers, notably Prussia, Russia, Great Britain, and Austria. Napoleon was then deposed and exiled to the island of Elba, and Louis XVIII (q.v.) was made ruler of France. In September, 1814, the Congress of Vienna, with delegates from most of the nations of Europe, convened to discuss problems arising from the defeat of France; see VIENNA, CONGRESS OF. On Feb. 26, 1815, however, while the Congress was still in session, Napoleon escaped from Elba and returned to France. There many veterans of his former campaigns flocked to his standard, and on March 20, 1815, he again ascended the throne. The Congress of

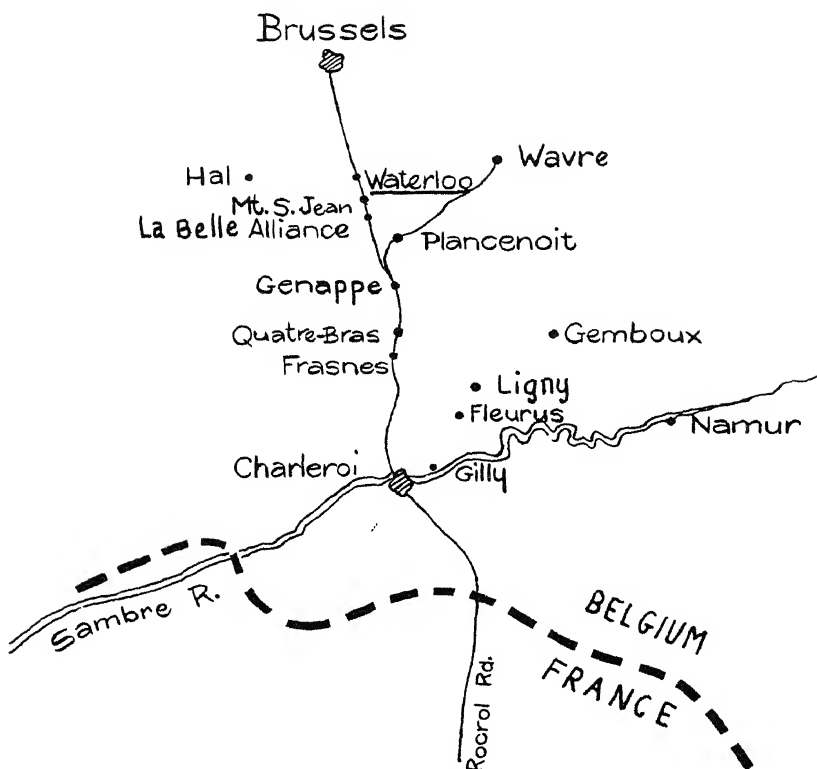
Vienna, alarmed by Napoleon's return to power, had reacted quickly to the crisis. On March 17 Austria, Great Britain, Prussia, and Russia each agreed to contribute 150,000 troops to an invasion force to be assembled in Belgium near the French border. A majority of other nations present at the Congress also pledged troops for the invasion of France, which was to be launched on July 1, 1815.

Mobilization and Strategy. In Paris Napoleon, learning of the invasion plan, quickly determined to attack the allies on their own ground before their army could take shape. With characteristic energy and decisiveness, he mobilized within two months an army of 360,000 trained soldiers. He deployed half of these troops within France as a security force, and grouped the remainder into attack units. On June 14, 1815, Napoleon, moving with the utmost speed and secrecy, reached the Franco-Belgian border with 124,000 of his troops. Another 56,000 men were left behind in secondary or supporting positions.

Napoleon's grand strategy for the coming campaign was typically audacious. Facing him beyond the Belgian border were two separate Allied armies. The larger army, a force of 116,000 Prussians and Saxons led by the Prussian field marshal Gebhard Leberecht von Blücher (q.v.), was based at Namur (see map). Advance elements of Blücher's army were stationed as far west as the towns of Gilly and Charleroi. A force of 93,000 British, Dutch, and German troops was based at Brussels, with an outpost in the village of Quatre-Bras. The leader of this army, the British general Arthur Wellesley, 1st Duke of Wellington (q.v.) was also commander in chief of the allied forces. Napoleon planned to attack both armies with the aim of splitting and destroying them. He intended then to deal with Russian and Austrian armies approaching France from the east. To carry out this plan he divided his forces into two attacking wings and a strategic reserve, which consisted of trusted veterans known as the Old Guard.

On June 15 Napoleon moved across the border into Belgium, and his sudden arrival caught the allied command unprepared. After crossing the Sambre R., the French routed a Prussian advance guard at Charleroi. Napoleon then ordered his left wing, under Marshal Michel Ney (q.v.), to attack a brigade of Wellington's cavalry at Quatre-Bras, 12 mi. north of Charleroi. He next ordered the right wing, under General Emmanuel de Grouchy (1766-1847) to move eastward against a Prussian brigade stationed in the town of Gilly. By late afternoon on June 15

WATERLOO, BATTLE OF



Map of maneuvers that culminated in the Battle of Waterloo.

Grouchy had completed his mission and pressed forward to a point near the village of Fleurus, where a corps of Blücher's men were concentrated. By nightfall on the first day of fighting, Napoleon's armies held the strategic advantage. The emperor had succeeded in placing his army between the advance elements of Wellington's and Blücher's, and his main force was in a position to swing either left against the Anglo-Dutch army or right to engage the Prussians.

On June 16 Napoleon moved with his reserve from Charleroi to Fleurus. There he assumed command of Grouchy's army and easily defeated the Prussian corps. He then drove north to the Ligny area to engage Blücher, who with his main army had hastened west from Namur hoping to intercept the French.

Ligny and Quatre-Bras. In the action at Ligny Napoleon's strategy was to coordinate his attack on Blücher with Ney's offensive at Quatre-Bras. The reserve would then swing east or west to aid either wing as circumstances dictated; and if all went well, the reserve would finally march northwest, join Ney at Quatre-Bras, and advance on Brussels to complete the split of the two allied armies. Early in the afternoon of June 16 Napoleon heard the sound of Ney's artillery

at Quatre-Bras. He then brought his force of 71,000 into action against Blücher's army of 83,000. After an hour of bloody and inconclusive fighting Napoleon dispatched an urgent message to Marshal Ney ordering him to send his I Corps, a force totaling 30,000 men, to the battlefield at Ligny. Instead of delivering the order through Marshal Ney's headquarters, Napoleon's courier took it directly to General Jean Baptiste Drouet D'Erlon (1765–1844), the I Corps commander. D'Erlon left immediately for Ligny. When Ney later learned of D'Erlon's departure, however, he dispatched a message ordering the corps back to Quatre-Bras. The message was delivered to D'Erlon just as he reached the Ligny battlefield. Again D'Erlon obeyed instructions, with the result that he took part in neither of the battles. Napoleon was able, however, to defeat Blücher after a sanguinary action lasting three hours. At twilight the Prussians withdrew, leaving 12,000 troops dead or wounded. Because of D'Erlon's failure to enter the fighting, however, the main body of Blücher's army, about 70,000 men, was able to retreat in good order.

Meanwhile, at Quatre-Bras, Ney had unaccountably waited several hours to begin his attack on the Anglo-Dutch position, and this

delay enabled Wellington to reinforce Quatre-Bras with several divisions of cavalry and infantry. Ney finally attacked at 2 P.M., but was sharply repulsed. Successive onslaughts on the Anglo-Dutch positions were similarly unsuccessful; throughout the afternoon Ney was severely handicapped by the absence of D'Erlon's corps. At about 7 P.M. Wellington counterattacked vigorously and drove Ney back to the town of Frasnes, several miles south of Quatre-Bras. Ney lost 4300 troops and Wellington 4700 in the action. D'Erlon, however, joined Ney in Frasnes at 9 P.M.

Mont-Saint-Jean. Early in the morning of June 17 a courier from Blücher reached Wellington at Quatre-Bras and informed him of the Prussian defeat at Ligny. Wellington, realizing that Napoleon had outflanked him, promptly dispatched a message to Blücher suggesting that he swing to the northwest and join the Anglo-Dutch army for a united stand against Napoleon near the village of Mont-Saint-Jean, a few miles south of the town of Waterloo. Several hours later Wellington retired unobtrusively from Quatre-Bras, leaving behind a brigade of cavalry as a decoy to mislead Marshal Ney.

At Ligny, that same morning, Napoleon ordered Grouchy to take 30,000 troops and pursue Blücher's retreating army. Napoleon then sent messages to Ney at Frasnes ordering him to engage Wellington immediately. Ney, who was not aware of Wellington's retreat, failed to obey these orders. Napoleon arrived at Frasnes that afternoon, assumed command of Ney's forces, brushed aside the token force guarding Quatre-Bras, and set off with his army in pursuit of Wellington. Early that evening Napoleon came in sight of the Anglo-Dutch army dug in along a

high plain south of Mont-Saint-Jean. Both sides began at once to prepare for battle.

In the meantime, Grouchy had failed to overtake Blücher's army. At about 10 P.M. on June 17, Grouchy's scouts informed him that the Prussians, instead of retreating east to Namur, had turned northwest, seeking apparently a juncture with Wellington. Grouchy's message of warning to Napoleon brought the reply, sent at 10 A.M. on June 18, that Grouchy should keep trying to make contact with the Prussians. Grouchy's pursuit was slovenly and unhurried, and he failed to locate the enemy.

On the morning of June 18, the French and Anglo-Dutch armies were in battle position. The Anglo-Dutch forces, facing south, comprised 67,000 troops with 156 cannon, and Wellington had received assurances from Blücher that strong reinforcements from his army of 70,000 would arrive during the day. Wellington's strategy was therefore to resist Napoleon until Blücher's forces could arrive, outflank the emperor's right wing, and so overrun the whole French line. Napoleon's army, facing north, totaled 74,000 troops with 246 cannon. The emperor's battle plan was to capture the village of Mont-Saint-Jean, and thus cut off the Anglo-Dutch avenue of retreat to Brussels. Wellington's army could then be destroyed at Napoleon's leisure.

Ultimate Defeat. The battle began at 11:30 A.M. with a feint by Napoleon at Wellington's right. This maneuver, which proved unsuccessful, was followed by an 80-gun French bombardment designed to weaken the allied center. At about 1 P.M. Napoleon saw advance elements of Blücher's army approaching from the east. Once again the emperor dispatched a message

Field Marshal Gebhard von Blücher of Prussia leads his army to Waterloo to link up with the British forces under the Duke of Wellington.
U.S. Army Signal Corps



WATERLOO, BATTLE OF

to Grouchy, apprising him of the situation and ordering him to overtake and engage the Prussians.

Fierce cavalry and infantry engagements were being fought meanwhile along the ridge, south of Mont-Saint-Jean, which sheltered Wellington's main force. In each instance the French attacks were savagely repulsed. At 4 P.M. Blücher's advance troops, who had been awaiting an opportune moment, entered the battle and forced the French to fall back about half a mile. A determined counterattack restored the French lines and pushed the Prussians back a mile to the northeast. Shortly after 6 P.M. Ney drove deep into the Anglo-Dutch center and seriously endangered Wellington's entire line. Wellington rallied, however, and Ney was driven back. Napoleon then mounted a desperate general offensive, during which he committed all but five battalions of his Old Guard in an assault on the allied center. Allied infantrymen, formed into hollow squares, inflicted severe losses on the French, crushing the offensive. Although Napoleon regrouped his shattered forces and attacked again, the French situation became increasingly hopeless. At about 8 P.M. the Prussians, who had taken up positions on the extreme left of Wellington's line, drove through the French right wing, throwing most of Napoleon's troops into panic. Only valiant rearguard actions fought by a few Old Guard battalions enabled the emperor to escape. As Napoleon's routed army fled along the Charleroi road, Wellington and Blücher conferred and agreed that Prussian brigades should pursue the beaten French. During the night of June 18 the Prussians drove the French from seven successive bivouacs and finally forced them back across the Sambre R. into France.

Aftermath. Napoleon signed his second abdication on June 22, and on June 28 King Louis XVIII was restored to the throne of France thus ending the so-called Hundred Days (q.v.). British authorities accepted the former emperor's surrender on July 15; he was later exiled to the island of Saint Helena. So complete was Napoleon's downfall that Waterloo, the name given to his last battle, became a word synonymous with crushing defeat.

In his reminiscences about the Waterloo campaign, Napoleon severely criticized General Grouchy for his failure to intercept the Prussians after their retreat from Ligny. Another serious lapse was Ney's failure to attack Wellington on June 17 and thus prevent his withdrawal from Quatre-Bras; Ney also erred badly in ordering D'Erlon's corps to turn back from Ligny on June

16, thus depriving Napoleon of the chance to destroy Blücher's army. Finally, Napoleon himself erred in massing only 124,000 men before Charleroi when he might easily have marshaled more by drawing on reserve troops left in secondary positions.

Casualties. The Battle of Waterloo was one of the bloodiest in modern history. During the fighting of June 18 French casualties totaled about 40,000, British and Dutch about 15,000, and Prussian about 7000. At one point during the fighting about 45,000 men lay dead or wounded within an area of 3 sq.mi. Additional thousands of casualties were suffered by both sides during the three-day campaign that preceded the final battle.

The Battle in Literature. The Battle of Waterloo figures prominently in literature. It is an important feature of the epic poem *Childe Harold's Pilgrimage* (1812–18), by the British poet George Gordon, Lord Byron, and the poetic drama *The Dynasts* (1904–08), by the British author Thomas Hardy (qq.v.). The battle is also an event in the plots of the novels *The Charterhouse of Parma* (1839) by the French writer Stendhal, *Vanity Fair* (1847–48) by the British author William Makepeace Thackeray, and *Les Misérables* (1862) by the French writer Victor Hugo (qq.v.).

WATERMARK. See PAPER: *Machine Papermaking*.

WATERMELON, common name applied to the annual, trailing vine *Citrullus vulgaris*, of the family Cucurbitaceae, and to its large, edible fruit. This vine, a native of tropical Africa, is widely cultivated for its refreshing, sweet fruit. Under cultivation the watermelon averages about 25 lb. in weight. It is oblong or round in shape and has a thick, green or striped rind, containing juicy pulp with numerous smooth, flat seeds. When ripe, the flesh is pink or yellow; it is composed of 93 percent water. A variety which bears white-fleshed, inedible fruit is known as the citron melon, and is used like citron in preparing preserves. Dwarf varieties of the melon have been developed.

The watermelon is sensitive to frost and is easily stunted by cold. It thrives in a warm, sandy loam that is well supplied with humus. In the United States, more than 286,600 acres are devoted to watermelon production, chiefly in Florida, Texas, Georgia, and California. The average yield in the late 1960's exceeded 1,375,000 tons annually.

WATER MILFOIL, common name for any plant in the Water Milfoil family, Haloragaceae, especially of the genera *Myriophyllum* and

Gunnera. The family comprises about one hundred species, largely freshwater, perennial herbs. The name *Myriophyllum*, derived from the Greek, means myriad-leaved, and alludes to the fine, featherlike leaves, each subdivided many times. Depending on the species, the flowers, which are usually very small, may be perfect, monoecious, or dioecious, with from one to eight stamens. The flowers may have from two to four petals, or petals may be absent. The fruit is an indehiscent drupe or nutlet. A showy foliage plant, *G. chilensis*, sometimes grown in gardens, may be 6 ft. in height. A common species in aquariums is *M. proserpinacoides*, also known as parrot's-feather.

WATER MOCCASIN. See MOCCASIN.

WATER OUZELL. See DIPPER.

WATER POLLUTION, contamination of water supplies, as by sewage, industrial and agricultural wastes, silt, and refuse; see SEWAGE DISPOSAL. Contaminated water may affect human health, interfere with industrial processes requiring relatively pure water, reduce productivity of farmland dependent on irrigation water, and alter aquatic life. Nearly all areas of the world have water-pollution problems. Urbanization and the growth of industry have added to the burden of maintaining purity in water supplies. Because the demand for potable water doubles every twenty years in developed nations, and every ten years in developing countries, the problems are expected to increase in future decades.

Sewage. Both surface and underground waters are polluted by sewage that is discharged into bodies of water or by seepage. Underground water supplies are particularly important in the western half of the United States, where 25 percent of the water comes from wells. Sewage may contain bacteria, viruses, and other disease

organisms; decomposable organic matter, which kills aquatic life by reducing the necessary oxygen level in the water; inorganic salts, which cannot be removed by conventional water-treatment methods; and chemicals, such as phosphates and nitrates, which stimulate the growth of weeds and algae.

Pollution by and in Industry. Industrial wastes are sources of the same polluting factors as sewage, as well as oily materials that interfere with aquatic life, poisonous chemicals, and metal salts. Industrial wastes frequently are discharged into streams and lakes, thereby making the water inhospitable to fish and other wildlife.

In some industrial processes, water of poor sanitary quality may be suitable for cooling purposes. Steel-rolling equipment, however, is damaged by the chlorides normally present in drinking water. Water used in paper manufacture should be free of iron, manganese, and carbon dioxide. Many industries require water free of chemicals that cause corrosion or form scale in high-pressure boiler equipment. Manufacturing plants frequently install special water-purifying systems in order to avoid damage to equipment that may result from using local water supplies.

The Farmland and Pollution. Drainage from agricultural lands that use fertilizers, herbicides, and pesticides pollutes water supplies with inorganic salts, plant nutrients, and complex synthetic chemicals. Irrigation water may reduce farm productivity if the water contains a high concentration of inorganic salts. Seepage and runoff from animal manure piles add a variety of contaminants to water supplies.

Thermal Pollution and Radioactive Dust. Another source of water pollution, known as thermal pollution, is the discharge of heated water from electric-power plants into a river or open

Fish are victims of water pollution. The scene is the bank of a stream in Wisconsin.

U.S. Dept. of the Interior



WATER POLO

sea. The raising of the local water temperature by a few degrees can easily destroy the native fish life and upset the ecological balance of the region; see **ECOLOGY**.

Radioactive dust from nuclear explosions is added to water supplies by rainfall that washes the dust out of the skies and by runoff from rain that carries such dust from land surfaces. See **RADIOACTIVE FALLOUT**.

Human Health. Disease organisms transmitted by polluted water are responsible for cholera, typhoid fever, dysentery, infectious hepatitis, bilharziasis, and filariasis. The World Health Organization (q.v.) in 1966 attributed an epidemic of some 29,000 cases of hepatitis in India to water pollution. The organization also reported that some noninfectious diseases of humans may be caused by toxic pollutants in industrial wastes and that waters toxic to fish probably are unsuitable for human consumption.

See also **AIR POLLUTION**.

WATER POLO, aquatic team sport contested in swimming pools, in which the competing teams attempt to shoot a ball into netted goals at both ends of the playing area. There are two versions of the game, each with its own rules and regulations. International Water Polo rules are followed in Amateur Athletic Union competition. The other version of the game is Collegiate Water Polo.

Playing Area and Equipment. The pool or water area used must be a minimum of 20 m and a maximum of 30 m long, with a width between 8 m and 20 m and a depth of 1.8 m in International play (in Collegiate, it must be 45 to 60 ft. wide, between 75 and 100 ft. long, and at least 6 ft. deep). The ball is a tightly inflated rubber sphere, 0.68 m to 0.71 m in circumference in International (27 to 28 in. in Collegiate). The goals are rectangular netted frames of metal, either attached to the ends of the pool or constructed with buoys to float, and anchored at the respective goal lines; in size, each International goal must be 0.30 m deep, 3 m wide, and 0.9 m high from water surface to top (in Collegiate, 1½ ft. deep, 10 ft. wide, and 3 ft. high).

Polo Team and Officials. Each team in water polo has seven players: a goal keeper who must defend the goal without hanging onto the goal or using the side of the pool, and six field players. With the exception of the goal keeper, each player may use only one hand at a time in handling the ball. Players wear light caps, which are colored red, white, or blue for easier identification in the heavy splashing of energetic play.

In International and Olympic competition there is one referee, and in Collegiate and high school competition there are two referees. A match also requires two goal judges, a timekeeper, and a recorder. The duration of an International game is 20 minutes of actual play, with 4 periods of 5 minutes each, with a 2-minute interval between periods. A Collegiate game has 28 minutes of actual play, divided into 4 periods of 7 minutes each, with 2-minute intervals between quarters and a 5-minute interval between halves.

Rules of Play. Play begins when the referee, with each team spread out along its own goal line, throws the ball into the center of the pool. The team gaining possession of the ball then attempts to advance it toward the opponent's goal by passing it between teammates and dribbling it with their forearms. Each goal is worth one point. Players may advance the ball with any part of their bodies, but may not use more than one hand at a time and may not employ clenched fists. No player, except the goalie, when defending a goal in a pool with a shallow end, may walk upon or use the bottom, nor may he take the ball beneath the surface of the water. Players may not impede the free-limb movement of another player unless that player holds the ball. Penalties for infraction of these rules range from granting the offended player a free shot at the opponent's goal from the 4-yd. line, with only the opposing goalie permitted to defend against the shot (this is a minor penalty) to the major penalty (expulsion of a player for one minute or until a goal is scored); there is also a penalty throw after a major foul to prevent a goal in the attacking area. (These penalties apply to the International game.) After accumulating a specified number of fouls (3 in the International game), a player may be evicted from the game and replaced by a substitute.

History. Water polo originated in England during the 1870's and soon became popular in the United States. It was first played in the Olympics in 1900 and has remained an Olympic sport ever since; see **OLYMPIC GAMES**. The U.S. placed first only in 1904 at the Olympics in Saint Louis, Mo. Between 1932 and 1964 the Olympics were always won by either Hungary or Italy, where water polo is a major national sport. Hungary won again in 1976. In 1968 Yugoslavia won the Olympic water polo championship; in 1972, the U.S.S.R. won. The U.S. placed fifth in 1968 and third in 1972.

From approximately 1920 to 1946 the U.S. departed from the international rules for water polo by adopting for play a loosely inflated ball

which could be gripped in one hand and carried toward the goal. Opposing players usually attempted to seize the ball carrier, wrestle him under water, and render him helpless from loss of breath. This rough style of play eventually fell into disfavor and virtually disappeared by 1946. Since that time traditional water polo has had a rapid growth, starting in southern California and spreading throughout the western U.S. In the Los Angeles area of California alone, there are more than 120 high school varsity water polo teams. Water polo is also a varsity sport in every California State university and junior college having aquatic facilities.

In the early 1970's more than 17,000 people participated annually in the sport of water polo in the U.S. The Amateur Athletic Union of the United States (q.v.) has conducted national championships each year since 1906; the National Collegiate Athletic Association (q.v.) conducted its first national championship in 1969; and the Young Men's Christian Association (q.v.) has annually conducted a national invitational championship since 1961. Rule revisions, favored by improving American teams, have recently been proposed to speed up the play of water polo. These proposals are based to a great extent on dissatisfaction with rough, grab-and-hold tactics, used by several teams in the 1968 Olympic Games, which can slow down games and antagonize spectators.

WATERPOWER, power derived from the fall of water from a higher to a lower level and extracted by means of waterwheels or hydraulic turbines; see **TURBINE**; **WATER**; **WATERFALL**. Waterpower is a natural resource, available wherever a sufficient volume of steady water flow exists. The development of waterpower today requires extensive construction, including storage lakes, dams, by-pass canals, and the installation of large turbines and electric generating equipment; see **CANAL**; **DAM**; **ELECTRICITY**; **ELECTRIC-POWER SYSTEMS**. Because the development of hydroelectric power requires a large capital investment, it is often uneconomical for a region where coal or oil is cheap. This is in spite of the fact that the cost of fuel for a steam-powered generating plant is higher than that of running a hydroelectric plant. Most modern hydroelectric-plant projects are undertaken by national governments or by an international consortium if the development is on a river that forms a boundary between two countries.

History. The use of waterpower dates back to ancient Greece and Rome when waterwheels were used for the milling of corn. The availability of cheap slave and animal labor, however, re-

stricted the widespread application of waterpower until about the 12th century. During the Middle Ages, large wooden waterwheels were developed with a maximum power output of about 50 h.p. Modern waterpower owes its development to the British civil engineer John Smeaton (1724-92) who first built large waterwheels using cast-iron construction.

Waterpower played an important part in the development of early American towns. Starting with the grist mill and the sawmill of colonial times, waterpower gave the impetus to the growth of the textile, leather, and machine-shop industry in the early part of the 19th century. Although the steam engine had already been developed at this time, coal was scarce and wood unsatisfactory as a fuel. Waterpower helped to develop the early industrial cities until the opening of the canals to the Midwest provided cheap coal by the middle of the 19th century. Most of the cities in the Midwest developed along the so-called fall line, where the upland mountain region meets the coastal plain. Combining the advantages of available waterpower with location at the upstream end of river navigation, the earliest waterworks which led to the growth of cities in the Northeast were Pawtucket, R.I. (1790), Paterson, N.J. (1791) and Fall River, Mass. (1813). The Mississippi R. fall line at Saint Anthony Falls is largely responsible for the development of Minneapolis, Minn., as a grain-milling center.

Early American waterpower works were limited to drops of about 16 ft.; and dams and canals were necessary for the installation of successive waterwheels when the drop was greater. Large storage-dam construction, however, was not feasible, and low water flows during summer and fall, coupled with icing during the winter led to the replacement of nearly all waterwheels by steam when coal became readily available.

Development of Hydroelectric Power. The rebirth of waterpower had to await the development of the electric generator, further improvement of the hydraulic turbine, and the growing demand for electricity by the turn of the 20th century; see **DYNAMOELECTRIC MACHINERY**. Commercial power companies began to install a large number of small hydroelectric plants in the mountain regions near the major population centers, and by 1920, hydroelectric plants accounted for 40 percent of the electric power produced in the United States.

Hydroelectric-power generation was accelerated by the establishment of the Federal Power Commission (q.v.) in 1920. Although additional

WATERPOWER

hydroelectric plants were being built, the simultaneous development of larger and more efficient steam-power plants made it obvious that only very large and costly hydroelectric installations could compete effectively, and that the Federal government would have to assume a major share in their construction. Motivated by the search for the multiple utilization of water resources, including navigation, flood control, and irrigation, in addition to power production, the Tennessee Valley Authority (q.v.), or T.V.A., started government participation in large-scale waterpower development. Since its establishment in 1933, the T.V.A. has proven to be remarkably successful and laid the foundation for subsequent multipurpose construction, much of it in the western States.

Most major installations depend on a large water-storage reservoir upstream of the dam where water flow can be controlled and a nearly constant water level can be assured. Water flows through conduits, called penstocks, which are controlled by valves or turbine gates to adjust the flow rate in line with the power demand. The water then enters the turbines and leaves them through the so-called tailrace. The power generators are mounted directly above the turbines on vertical shafts. The design of turbines

used depends on the available head of water, with so-called Francis-type turbines used for high heads and Kaplan or propeller-turbines for low heads.

In contrast to storage-type plants, which depend on the impounding of large amounts of water, a few examples exist where both the water drop and the steady flow rate are high enough to permit so-called run-of-the-river installations. A notable example of this kind is the joint U.S.-Canadian Niagara Falls power project; see NIAGARA FALLS.

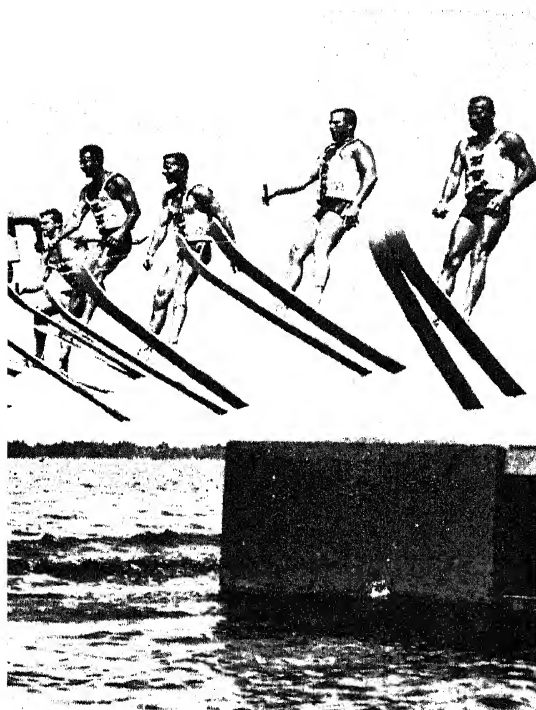
Although hydroelectric-power generation in the U.S. has increased from about 16,000,000,000 kw hours in 1920 to about 300,000,000,000 kw hours annually in the mid-1970's, the percentage amount of electrical power generated by waterpower has decreased from 40 percent to about 16 percent during the same period. The electric power generated by steam and internal-combustion engines in the U.S. totaled more than 1,530,000,000,000 kw hours annually in the mid-1970's. This relative decrease in importance of hydroelectric power is not true in many other parts of the world, notably in the Soviet Union, where the world's largest dams and hydroelectric plants are under construction. The Sayansk plant in the Soviet Union is expected to have the greatest capacity (6300 megawatts) when completed, followed by the Krasnoyarsk plant (opened in 1967) on the Yenisey R., which produces 6000 megawatts. This may be compared to the eventual capacity of the Grand Coulee Dam, which is expected to provide slightly less than 6000 megawatts; see *TURBINE: Hydraulic Turbines*. The Nurek dam in the U.S.S.R., completed in 1972, is the world's highest dam, with a height of 1040 ft.

Other major hydroelectric-power developments completed in the 1970's include the dams at Churchill Falls and Kettle Rapids in Canada, on the Danube R. in Rumania and Yugoslavia, and the Aswān High Dam (q.v.) on the Nile R. in the Arab Republic of Egypt. F.La.

WATERPROOFING. See SILICONES.

WATERS, Ethel (1896-1977), American singer and actress, born in Chester, Pa. One of the most prominent black performers of American stage and screen during the 1930's and 1940's, she first appeared in cabarets in the 1920's as a blues singer. Her sweet style of singing brought her to national popularity, and among her best-known songs were "Stormy Weather" and "Dinah". She first appeared on the Broadway stage in *Africana* in 1927 and later sang in the musical shows *Blackbirds* (1930), *As Thousands Cheer* (1933), and *Cabin in the Sky* (1940). Her

Water-skiing champions perform a one-handed jump at Cypress Gardens, Fla. UPI



first successful dramatic role was in *Mamba's Daughters* (1938), but her most memorable stage role was that of the cook Berenice in the 1950 production of *The Member of the Wedding*, by the American writer Carson McCullers (q.v.). She also appeared in the motion pictures *Cabin in the Sky* (1940), *Pinky* (1949), and *The Member of the Wedding* (1953). Waters wrote two autobiographical works, *His Eye Is on the Sparrow* (1951) and *To Me It's Wonderful* (1972). She played an active part in the spiritual crusades of the American evangelist Billy Graham; see GRAHAM, WILLIAM FRANKLIN.

WATER-SKIING, recreational and competitive sport in which persons mounted on skis are towed across the surface of water by motorboats moving at speeds from 15 to more than 35 m.p.h. The sport was invented in 1922 in the United States, and its ruling body, the American Water Ski Association (A.W.S.A.), was founded in 1939, when the first national water-skiing tournament was held at Jones Beach State Park, Long Island, N.Y.

Equipment and Technique. Water skis are made usually of ash, mahogany, or plastic reinforced with glass. They are generally $5\frac{1}{2}$ to 6 ft. long and 6 in. wide, and are equipped with rubber foot bindings. Fins located on the underside of the skis promote stability and facilitate the execution of sharp turns at high speeds. The towrope is $\frac{1}{4}$ in. in diameter and about 75 ft. long.

Water-skiing runs begin usually with the participant crouched on skis and holding a towrope attached to a motorboat. As the boat accelerates, the skis begin to plane over the water and the skier stands upright; some skiers, at speeds over 35 m.p.h., can skim across the water on their bare feet. Certain maximum speeds are allowable, depending upon the age group of the skier. In endurance tests, experts have traveled more than 700 mi. on water skis without stopping.

Slalom, Jumping, and Trick Riding. Competitive water-skiing is conducted under close supervision by judges who award points to the contestants. The six categories of skiers range from novice to master. The chief events in water-skiing contests are slalom, jumping, and trick riding. Water-ski kite flying, including slalom and trick riding, has also recently become a part of A.W.S.A. competition.

In the ordinary slalom event, the towing boat speeds straight through a field of anchored buoys while the contestant, riding on a single ski, pursues a zigzag course in and out of the buoys, swinging back and forth across the wake

of the motorboat. Contestants who complete the course successfully are towed through it at successively higher speeds until the maximum under the rules is approached. Then, if more than one skier remains in the contest, the towline is shortened until all but one are eliminated as a result of falls or of missing a buoy.

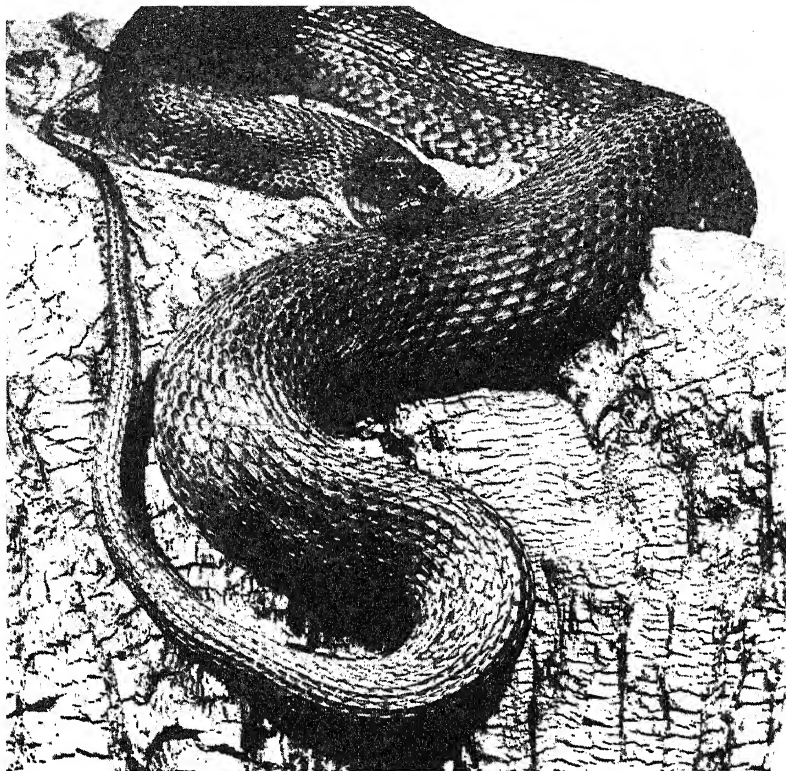
In the jumping event the contestant, towed at a speed accordant with his particular age group, skis up a waxed, wooden ramp and leaps off it for distance. The ramp is from 12 to 14 ft. wide and 21 to 22 ft. long out of water; at its highest point it extends from 5 to 6 ft. above the water. To execute a jump the contestant swings about 40 ft. to one side of the wake of the motorboat and ascends the ramp. Jumps made from a 6-ft. ramp at 35 m.p.h. have been measured at over 160 ft. These distances have been achieved by using double wake cuts, that is, approaches whereby the skier crosses the wake of the towing boat twice. This so-called crack-the-whip maneuver enables the jumper to attain speeds in excess of 50 m.p.h. as he reaches the ramp. Jumps are judged on the basis of form and distance covered. Contestants often fall into the water, but serious injuries are rare.

The trick-riding contest consists of a series of maneuvers on finless skis, during which the skier accomplishes as many officially recognized tricks as he can within two 20-sec. passes through the course. The tricks are awarded points based on their relative difficulty, and the skier with the most total points, including a percentage bonus for form, wins the event. Rules of the A.W.S.A. recognize more than sixty tricks, ranging from a 180° turn on two skis (30 points) to a mid-air somersault off the jump ramp on a single ski (570 points).

Tournaments and Competitions. The A.W.S.A. has a membership of more than 10,000, with some 250 affiliated water-skiing clubs active across the U.S., and overall an estimated 10,000,000 Americans participate in the sport each year. The A.W.S.A. sanctions more than 100 tournaments annually, with the national championships usually being held in the third week of August. Internationally, water-skiing is organized in more than 45 countries and supervised by the World Water Ski Union. A world tournament has been held every two years since 1949.

See also SKIING.

WATER SNAKE, any nonpoisonous, aquatic serpent of the genus *Natrix*, closely related to the garter snakes. Several species of water snakes are native to the United States. The most familiar species is *N. sipedon* of the northeastern U.S. The average length is about 3 ft. The



Green water snake, Natrix cyclopion floridana

Dade W. Thornton -
National Audubon Society

color is a variable brown, with large, dark-brown markings on the back and sides, and with the belly yellowish or reddish, spotted with reddish-brown, rounded spots. These colors, together with its habits and somewhat broad head, lead to its often being mistaken for the venomous moccasin snake, of which some naturalists consider it a mimic; see MOCCASIN. The water snake is semiaquatic in its habits, usually being found on the borders of the water. It is an expert swimmer and diver, and is skillful at catching slow-moving fish, frogs, and toads, on which it subsists. When cornered it is pugnacious, but its bite is harmless. The young of the water snake, which may number as many as sixty, are born alive.

WATER SOFTENING. See WATER: *Water Purification*.

WATER SPANIEL. See AMERICAN WATER SPANIEL; IRISH WATER SPANIEL.

WATER STRIDER, common name applied to slender, six-legged water bugs of the family Geridae, belonging to the order Hemiptera; see BUG. The water strider is a spiderlike insect which lives on the surface of quiet waters and darts about with great rapidity, using the middle pair of legs as paddles and the hind pair for steering. Fine, dense hairs on their feet keep them from breaking the water's surface film.

WATER SUPPLY AND WATERWORKS, provision of a supply of water for domestic, indus-

trial, and irrigation needs, and the engineering installations necessary to treat and pump the water to the consumer; see WATER. In the United States today, the average daily water consumption rate in populated areas ranges from 100 to 250 gal. per person per day, and extensive water-treatment plants are essential for providing water safe for human consumption.

Sources of Water. The ultimate source of all natural potable water on the earth is rain (q.v.), which is rarely used as a direct source except on islands in salt water, such as Bermuda, where the rain is collected and led into cisterns to serve as the only available water supply. When rain falls, it runs off into streams, in the case of heavy rains, or soaks into the ground, percolating through porous strata until it reaches an impervious stratum, upon which it collects, forming groundwater. Groundwater is the source of wells and of the springs which feed streams, rivers, and lakes. In its course groundwater dissolves soluble mineral matter, and often the surface waters of rivers and lakes are polluted by the influx of sewage or industrial wastes; see SEWAGE DISPOSAL; WATER POLLUTION. In modern water-supply systems an entire watershed is usually made into a reservation to control pollution. The waters are impounded by a system of dams, and flow by gravity, or are pumped, to the local distribution system.

The quality of water from these sources varies

greatly. Surface waters generally contain larger quantities of turbidity and bacteria (q.v.) than groundwaters, but groundwater contains higher concentrations of dissolved chemicals. Seawater contains high concentrations of dissolved chemicals and some microscopic organisms as well. Because water quality does vary from source to source, the United States Public Health Service (q.v.) has established standards for drinking water used in interstate commerce. Similar standards have been adopted by all of the States and the World Health Organization (q.v.). These standards recommend and restrict the concentration of chemical compounds that may be allowed in water being considered as a source for supply, and the bacterial concentration that may be allowed in the treated water.

Treatment. Undesirable tastes and odors are removed from water by aeration. Bacteria are destroyed by the addition of a few parts per million of chlorine (q.v.), and the taste of chlorine is then removed with sodium sulfite. Excessive hardness, which renders the water unsuitable for many industrial purposes, is reduced by the addition of slaked, or hydrated, lime (q.v.) or by an ion-exchange process using zeolite (q.v.) as a water softener. Suspended organic matter, which supports bacterial life, and suspended mineral matter are removed by the addition of a flocculating and precipitating agent, such as alum (q.v.), before settling or filtration. Artificial fluoridation of public water supply is practiced in many U.S. communities as a measure for preventing dental caries; see DENTISTRY; FLUORINE; TEETH; *Human Teeth: Recent Developments*.

History. Primitive man had no need of engineering works to supply his water. Hunters and nomads camped near such natural sources of fresh water as springs, rivers, and lakes, and populations were so sparse that pollution of the water supply was not a serious problem. After community life developed, however, and agricultural villages became urban centers, the problem of supplying water for all the inhabitants of a city became important, and, in many cases, a supply of water for irrigation (q.v.) became necessary for the farms surrounding the city and producing the food for its peoples. Irrigation works were constructed in prehistoric times, and before 2000 B.C. the rulers of Babylonia and Egypt (qq.v.) constructed systems of dams and canals to impound the flood waters of the Euphrates and Nile (qq.v.) rivers, controlling floods and providing irrigation water throughout the dry season; see CANAL; DAM. Such irrigation canals also served to supply water for domestic purposes. The first people to consider

the sanitation of their water supply were the ancient Romans, who constructed a vast system of aqueducts to bring the clean waters of the Apennine Mts. into the city, and built settling basins and filters along these mains to insure the clarity of the water; see AQUEDUCT. The construction of such extensive water-supply systems declined when the Roman Empire disintegrated, and for several centuries local springs and wells formed the principal source of domestic and industrial water.

The invention of the force pump in England in the middle of the 16th century greatly extended the possibilities of development of water-supply systems; see PUMPS AND PUMPING MACHINERY. At London in 1562 the first pumping waterworks was completed; it pumped river water to a reservoir 120 ft. above the level of the Thames R. and from the reservoir the water was distributed by gravity, through lead pipes, to buildings in the vicinity. The first municipal pumping station in the U.S. was erected about 1760 to supply water to the town of Bethlehem, Pa. It consisted of a 5-in. wooden pump which raised the water 70 ft. through pipes made of bored hemlock logs. By 1800 sixteen American cities had water-supply systems, and since that time almost every city and town in the country has been provided with municipal waterworks, most of them publicly owned and operated. In addition to the municipal systems, many State and Federal developments provide water for irrigation, industrial, or domestic uses as a by-product of navigation control, hydroelectric-power generation, and flood control; see ELECTRIC-POWER SYSTEMS; FLOOD CONTROL; WATER POWER.

Rapid growth of industry, increased population, and rising per-capita demand created a national water shortage in the U.S. in the 1950's. An official committee was established in 1954 by the provisions of the Water Facilities Act to recommend legislation for better control of existing supplies and the development of new sources. The re-use of water by industry, which consumes a large percentage of the nation's total supply, is encouraged by the government.

Seawater Desalinization. In recent years a great deal of interest has been shown in the conversion of seawater to fresh water. Several different processes, including distillation (q.v.), electrodialysis, reverse osmosis (see OSMOSIS), and direct-freeze evaporation, have been developed for this purpose. Some of these processes have been used in large facilities. Distillation units, for example, are being used in Freeport, Bahamas, Saint Thomas, U.S. Virgin Islands, and

WATER TABLE

in Texas. A reverse-osmosis system is used for the city of Bessie, Okla., and an electrodialysis system is used for Port Mansfield, Texas. Although these processes are successful, the cost of treating seawater is much higher than that for treating fresh water. See **WATER: Water Desalination**.

WATER TABLE. See **WATER: Natural Water Cycle**.

WATERTON LAKES NATIONAL PARK. See **ALBERTA: The Land: Parks and Other Places of Interest**.

WATERTOWN, city in New York, and county seat of Jefferson Co., on the Black R., 65 miles N. of Syracuse. The Black R. falls 112 ft. within Watertown, providing abundant water power, and the city is a manufacturing center. The chief industrial products are paper, the manufacture of which dates from 1809, clinical thermometers, paint, deodorizers, hats, electric motors, hydraulic equipment, snow plows, rubber rollers, garbage trucks, plastic products, ski lifts, safety tools, and women's clothing. Watertown is also the commercial center of an important dairy-farming area and a gateway to vacation resorts in the Thousand Islands (q.v.) and the Adirondack Mts. About 10 mi. to the N.E. is Camp Drum, a vast military reservation.

Among points of interest in the city are Flower Memorial Library, the Jefferson County Historical Society Museum, and numerous churches, the largest and most attractive of which are Trinity Episcopal, the Sacred Heart and Holy Family (Catholic), and the First Presbyterian. Watertown was founded in 1800 and became the county seat five years later. It was incorporated as a village in 1816 and as a city in 1869. Pop. (1960) 33,306; (1970) 30,787.

WATERTOWN, city in South Dakota, and county seat of Codington Co., on the Big Sioux R., 85 miles S.E. of Aberdeen. It is served by railroad and maintains a municipal airport. The city is a lake-resort center, and the principal trading center and shipping point of the N.E. quarter of the State, a rich farming and stock-raising area. Among the industrial establishments in Watertown are plants producing rubber goods, bakery products, and cement. Nearby are several extensive chick hatcheries, and deposits of sand and gravel. Watertown has a Carnegie library and recreational facilities in the city parks and at Lake Kampeska, to the W. Watertown was founded in 1878 and incorporated in 1885. Pop. (1960) 14,077; (1970) 13,388.

WATERTOWN, city of Wisconsin, on the Dodge and Jefferson county lines, about 33 miles N.E. of Madison. Manufactures include

leather and wood products, machinery, and metal products. Carl Schurz (q.v.), the American political leader, settled in Watertown in 1856. Northwestern College, established in 1865, is in the city. Watertown was settled about 1836 and incorporated in 1855. Pop. (1960) 13,943; (1970) 15,683.

WATERTOWN, town of Massachusetts, in Middlesex Co., 7 miles W. of Boston, of which it is a residential and manufacturing suburb. Watertown includes several villages. The principal industrial establishments are engaged in the manufacture of rubber goods, jacks and lifts, elevating trucks, plastics, foods and canned goods, lighting fixtures, clothing, textile machinery, enamel, and cork insulation. Watertown is the seat of Perkins School for the Blind (1829) and of a Federal arsenal (1816). The town was settled and incorporated in 1630. Pop. (1960) 39,092; (1970) 39,307.

WATER TURKEY. See **DARTER**.

WATERVILLE, city of Maine, in Kennebec Co., on the Kennebec R., 18 miles N. of Augusta. It is a rail, trading, and manufacturing center of a fertile agricultural region. The Ticonic Falls of the Kennebec at Waterville furnish water power for the industries of the city, which include railroad repair shops and factories engaged in the manufacture of paper and pulp, worsteds and men's shirts. Waterville is the site of Colby College (q.v.). The area was settled about 1760; Waterville was a part of the town of Winslow, on the opposite side of the river, until 1802, when it was incorporated as a separate town. The city of Waterville was incorporated in 1883 and chartered in 1888. Pop. (1960) 19,001; (1970) 18,192.

WATERVLIET, city of New York, in Albany Co., at the head of navigation on the Hudson R., opposite Troy, with which it is connected by bridge, and about 5 miles N. of the city of Albany. It is served by railroad and contains railroad repair shops. The city is an industrial center manufacturing sandpaper and steel products. Watervliet is the site of the oldest arsenal in the United States, established in 1813 and still an important source of heavy ordnance material for the United States Army. Watervliet was incorporated as the village of West Troy in 1836 and in 1896 was chartered under its present name. The first settlement in the U.S. of a group belonging to the Shaker sect (see **SHAKERS**) was established near Watervliet in 1776. Pop. (1960) 13,917; (1970) 12,404.

WATERWHEEL. See **TURBINE; WATERPOWER**.

WATERWORKS. See **WATER SUPPLY AND WATERWORKS**.

